

SEQUENCE LISTING



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<110> BRILES, David E.
HOLLINGSHEAD, Susan K.
BROOKS-WALTER, Alexis

<120> PNEUMOCOCCAL SURFACE PROTEIN C (PSPC), EPITOPIC REGIONS
AND STRAIN SELECTION THEREOF, AND USES THEREFOR

<130> 454312-3140

<140> 09/298,523

<141> 1999-04-23

<150> 60/082,728

<151> 1998-04-23

<160> 276

<170> PatentIn Ver. 2.0

<210> 1

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 1

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Leu Gly
20 25 30

Gly Val Val His Ala Glu Gly Val Arg Gly Ile Thr Gln Ser Gly Asn
35 40 45

Asn Leu Thr Val Thr Ser Ser Gly Gln Asp Ile Ser Lys Lys Tyr Ala
50 55 60

Asp Glu Val Glu Ser His
65 70

<210> 2

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 2

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Leu Gly
20 25 30

Gly Val Val His Ala Glu Gly Val Arg Gly Ile Thr Gln Ser Gly Asn
35 40 45

Asn Leu Thr Val Thr Ser Ser Gly Gln Asp Ile Ser Lys Lys Tyr Ala
50 55 60

Asp Glu Val Glu Ser His
65 70

<210> 3

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 3

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly
20 25 30

Ser Val Val His Ala Thr Glu Asn Glu Gly Ile Thr Gln Val Ala Thr
35 40 45

Ser Tyr Asn Lys Ala Asn Glu Ser Gln Thr Glu His Arg Lys Ala Ala
50 55 60

Lys Gln Val Asp Glu Asp
65 70

<210> 4

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 4

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly
 20 25 30
 Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr
 35 40 45
 Ser Ser Asn Met Ala Lys Glu Ser Gln Thr Glu His Arg Lys Ala Ala
 50 55 60
 Lys Gln Val Val Asp Asp
 65 70

<210> 5
 <211> 32
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 5
 Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys
 1 5 10 15
 Glu Ser Gln Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Asp
 20 25 30

<210> 6
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 6
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15
 Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly
 20 25 30

Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr
 35 40 45
 Ser Ser Asn Met Ala Lys Glu Ser Gln Thr Glu His Arg Lys Ala Ala
 50 55 60
 Lys Gln Val Val Asp Asp

65

70

<210> 7

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 7

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly
 20 25 30

Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr
 35 40 45

Ser Ser Asn Met Ala Lys Glu Ser Gln Thr Glu His Arg Lys Ala Ala
 50 55 60

Lys Gln Val Val Asp Asp
 65 70

<210> 8

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 8

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Leu Gly
 20 25 30

Gly Val Val His Ala Glu Gly Val Arg Gly Ser Thr Gln Ser Glu Asn
 35 40 45

Thr Pro Lys Val Thr Ser Ser Gly Gln Thr Glu His Arg Lys Ala Ala
 50 55 60

Lys Gln Val Val Asp Asp
 65 70

<210> 9

<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 9
Met Phe Ala Ser Lys Asn Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15
Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Met Gly
20 25 30
Ser Val Val His Ala Thr Glu Val Arg Gly Ser Thr Gln Lys Glu Val
35 40 45
Thr Thr Gln Val Ala Thr Ser Phe Asn Lys Ala Asn Lys Ser Gln Thr
50 55 60
Glu His Met Lys Ala Asp
65 70

<210> 10
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 10
Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15
Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly
20 25 30
Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr
35 40 45
Ser Ser Asn Met Ala Lys Ser Phe Asn Thr Glu His Arg Lys Ala Ala
50 55 60
Lys Gln Val Val Asp Asp
65 70

<210> 11
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 11
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15
 Phe Ser Ile Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly
 20 25 30
 Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr
 35 40 45
 Phe Ser Asn Met Ala Asn Lys Ser Gln Thr Glu Gln Gly Glu Ala Ala
 50 55 60
 Lys Gln Ile Asn Ile Glu
 65 70

<210> 12
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 12
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15
 Phe Ser Val Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly
 20 25 30
 Ser Val Val His Ala Thr Glu Asn Glu Gly Ala Thr Gln Val Pro Thr
 35 40 45
 Ser Ser Asn Arg Ala Asn Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro
 50 55 60
 Lys Lys Leu Asp Ser Glu
 65 70

<210> 13
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 13
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15

Phe Ser Val Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly
 20 25 30
 Ser Val Val His Ala Thr Glu Asn Glu Gly Ala Thr Gln Val Pro Thr
 35 40 45
 Ser Ser Asn Arg Ala Asn Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro
 50 55 60
 Lys Lys Leu Asp Ser Glu
 65 70

<210> 14
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 14
 Leu Glu Ser Ile Leu Lys Asp Val Lys Lys Asn Leu Lys Lys Val Gln
 1 5 10 15
 Ser Glu Ile Gln Leu Asp Lys Arg Lys Asp Arg His Thr Gln Asn Val
 20 25 30
 Gly Leu Ile Thr Lys Leu Ser Glu Ile Lys Lys Lys Tyr Leu Tyr Asp
 35 40 45
 Leu Lys Val Asn Val Leu Ser Glu Ala Glu Leu Thr Ser Lys Thr Lys
 50 55 60
 Glu Thr Lys Glu Lys Leu
 65 70

<210> 15
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 15
 Leu Glu Ser Ile Leu Lys Asp Val Lys Lys Asn Leu Lys Lys Val Gln
 1 5 10 15
 Ser Glu Ile Gln Leu Asp Lys Arg Lys Asp Arg His Thr Gln Asn Val
 20 25 30
 Gly Leu Ile Thr Lys Leu Ser Glu Ile Lys Lys Lys Tyr Leu Tyr Asp

35 40 45
 Leu Lys Val Asn Val Leu Ser Glu Ala Glu Leu Thr Ser Lys Thr Lys
 50 55 60

Glu Thr Lys Glu Lys Leu
 65 70

<210> 16
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 16
 Ile Lys Lys Met Leu Ser Glu Ile Gln Glu Tyr Ile Lys Lys Met Leu
 1 5 10 15

Ser Glu Ile Gln Leu Asp Lys Arg Lys Asp Arg His Thr Gln Asn Val
 20 25 30

Asn Leu Asn Arg Lys Leu Ser Ala Ile Gln Thr Lys Tyr Leu Tyr Glu
 35 40 45

Leu Arg Val Leu Lys Glu Ser Lys Ser Lys Lys Glu Glu Leu Thr Ser
 50 55 60

Lys Thr Lys Lys Glu Leu
 65 70

<210> 17
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 17
 Ile Lys Lys Met Leu Ser Glu Ile Gln Glu Tyr Ile Glu Lys Met Leu
 1 5 10 15

Arg Glu Ile Gln Leu Asp Arg Arg Lys Asp Arg His Thr Gln Asn Val
 20 25 30

Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg Glu
 35 40 45

Leu Asn Val Leu Glu Glu Ser Lys Lys Ser Lys Asp Glu Leu Pro Ser
 50 55 60

Glu Ile Lys Ala Lys Leu
65 70

<210> 18
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 18
Ile Lys Lys Met Leu Ser Glu Ile Gln Glu Tyr Ile Glu Lys Met Leu
1 5 10 15

Arg Glu Ile Gln Leu Asp Arg Arg Lys Asp Arg His Thr Gln Asn Val
20 25 30

Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg Glu
35 40 45

Leu Asn Val Leu Glu Glu Ser Lys Lys Ser Lys Asp Glu Leu Pro Ser
50 55 60

Glu Ile Lys Ala Lys Leu
65 70

<210> 19
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 19
Ile Lys Lys Met Leu Ser Glu Ile Gln Glu Tyr Ile Glu Lys Met Leu
1 5 10 15

Arg Glu Ile Gln Leu Asp Arg Arg Lys Asp Arg His Thr Gln Asn Val
20 25 30

Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg Glu
35 40 45

Leu Asn Val Leu Glu Glu Ser Lys Lys Ser Lys Asp Glu Leu Pro Ser
50 55 60

Glu Ile Lys Ala Lys Leu
65 70

<210> 20
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 20
Ile Lys Lys Met Leu Ser Glu Ile Gln Glu Tyr Ile Glu Lys Met Leu
1 5 10 15
Arg Glu Ile Gln Leu Asp Arg Arg Lys Asp Arg His Thr Gln Asn Val
20 25 30
Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg Glu
35 40 45
Leu Asn Val Leu Glu Glu Ser Lys Lys Ser Lys Asp Glu Leu Pro Ser
50 55 60
Glu Ile Lys Ala Lys Leu
65 70

<210> 21
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 21
Ile Lys Lys Met Leu Asp Glu Val Asp Glu Tyr Ile Lys Lys Met Leu
1 5 10 15
Ser Glu Ile Gln Leu Asp Lys Arg Lys Asp Arg His Thr His Asn Phe
20 25 30
Ala Leu Asn Leu Lys Leu Ser Arg Ile Lys Thr Glu Tyr Leu Tyr Lys
35 40 45
Leu Lys Val Asn Val Leu Glu Glu Lys Ser Lys Ala Glu Leu Thr Ser
50 55 60
Lys Thr Lys Lys Glu Val
65 70

<210> 22
<211> 70
<212> PRT

<213> Streptococcus pneumoniae

<400> 22

Ile Lys Lys Met Ala Lys Gln Val Asp Glu Tyr Ile Thr Lys Lys Leu
1 5 10 15

Ser Glu Ile Gln Leu Asp Arg Arg Lys Asp Arg His Thr Gln Asn Val
20 25 30

Gly Leu Leu Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Arg
35 40 45

Leu Ser Val Ser Lys Glu Glu Glu Lys Ser Glu Ala Glu Leu Pro Ser
50 55 60

Glu Ile Lys Ala Lys Leu
65 70

<210> 23

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 23

Ile Lys Lys Met Ala Lys Gln Val Asp Glu Tyr Ile Glu Lys Met Leu
1 5 10 15

Arg Glu Ile Gln Leu Asp Arg Arg Lys Asp Arg His Thr Gln Asn Val
20 25 30

Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg Glu
35 40 45

Leu Asn Val Leu Glu Glu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser
50 55 60

Glu Ile Lys Ala Lys Leu
65 70

<210> 24

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 24

Arg Asp Lys Ala Lys Thr Ala Val Ser Glu Tyr Lys Glu Lys Lys Val

| | | | |
|---|----|----|----|
| 1 | 5 | 10 | 15 |
| Ser Glu Ile Tyr Thr Lys Leu Glu Arg Asp Arg His Lys Asp Thr Val | | | |
| 20 | 25 | 30 | |
| Asp Leu Val Asn Lys Leu Gln Glu Ile Lys Asn Glu Tyr Leu Asn Lys | | | |
| 35 | 40 | 45 | |
| Ile Val Gln Ser Thr Ser Glu Lys Thr Glu Ile Gln Gly Leu Ile Thr | | | |
| 50 | 55 | 60 | |
| Thr Ser Arg Ser Lys Leu | | | |
| 65 | 70 | | |

<210> 25
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

| |
|---|
| <400> 25 |
| Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val |
| 1 5 10 15 |
| Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val |
| 20 25 30 |
| Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys |
| 35 40 45 |
| Ile Val Glu Ser Thr Ser Glu Glu Ser Gln Leu Gln Ile Leu Met Met |
| 50 55 60 |
| Glu Ser Arg Ser Lys Val |
| 65 70 |

<210> 26
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

| |
|---|
| <400> 26 |
| Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val |
| 1 5 10 15 |
| Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val |
| 20 25 30 |

Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys
35 40 45

Ile Val Glu Ser Thr Ser Glu Glu Ser Gln Leu Gln Ile Leu Met Met
50 55 60

Glu Ser Arg Ser Lys Val
65 70

<210> 27
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 27
Thr Ala Thr Phe Glu Gln Phe Lys Lys Asp Thr Ser Ser Ser Ser Ser
1 5 10 15

Ser Gly Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
20 25 30

Leu Pro Thr Glu Pro Glu Lys Lys Val Ala Glu Ala Gln Lys Lys Val
35 40 45

Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Arg Arg
50 55 60

Asn Tyr Pro Thr Ile Thr
65 70

<210> 28
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 28
Thr Ala Thr Phe Glu Gln Phe Lys Lys Asp Thr Ser Ser Ser Ser Ser
1 5 10 15

Ser Gly Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
20 25 30

Leu Pro Thr Glu Pro Glu Lys Lys Val Ala Glu Ala Gln Lys Lys Val
35 40 45

Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Arg Arg
 50 55 60

Asn Tyr Pro Thr Ile Thr
 65 70

<210> 29
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 29
 Asp Ala Ala Phe Glu Lys Phe Lys Lys Glu Thr Ser Ser Ser Ser Ser
 1 5 10 15

Ser Gly Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
 20 25 30

Leu Pro Thr Glu Pro Glu Lys Lys Val Ala Glu Leu Thr Lys Lys Leu
 35 40 45

Ala Glu Ala Lys Gln Lys Ala Lys Ala Gln Lys Glu Glu Asp Phe Arg
 50 55 60

Asn Tyr Pro Thr Asn Thr
 65 70

<210> 30
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 30
 Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr Ser Ser Ser Ser Ser
 1 5 10 15

Ser Gly Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
 20 25 30

Leu Pro Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val
 35 40 45

Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg
 50 55 60

Asn Tyr Pro Thr Asn Thr

65

70

<210> 31
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 31
 Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr Ser Ser Ser Ser Ser
 1 5 10 15
 Ser Gly Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
 20 25 30
 Leu Pro Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val
 35 40 45
 Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg
 50 55 60
 Asn Tyr Pro Thr Asn Thr
 65 70

<210> 32
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 32
 Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr Ser Ser Ser Ser Ser
 1 5 10 15
 Ser Gly Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
 20 25 30
 Leu Pro Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val
 35 40 45
 Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg
 50 55 60
 Asn Tyr Pro Thr Asn Thr
 65 70

<210> 33

<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 33
Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr Ser Ser Ser Ser Ser
1 5 10 15
Ser Gly Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
20 25 30
Leu Pro Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val
35 40 45
Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg
50 55 60
Asn Tyr Pro Thr Asn Thr
65 70

<210> 34
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 34
Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr Ser Ser Ser Ser Ser
1 5 10 15
Ser Gly Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
20 25 30
Leu Pro Leu Lys Leu Gly Glu Lys Val Ala Glu Ala Gln Lys Lys Val
35 40 45
Glu Glu Ala Lys Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp His Arg
50 55 60
Asn Tyr Pro Thr Asn Thr
65 70

<210> 35
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 35
 Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Ser Ser Ser Ser Ser
 1 5 10 15
 Ser Gly Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
 20 25 30
 Leu Pro Thr Glu Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val
 35 40 45
 Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg
 50 55 60
 Asn Tyr Pro Thr Ile Thr
 65 70

<210> 36
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 36
 Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr Ser Ser Ser Ser Ser
 1 5 10 15
 Ser Gly Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
 20 25 30
 Leu Pro Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val
 35 40 45
 Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg
 50 55 60
 Asn Tyr Pro Thr Asn Thr
 65 70

<210> 37
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 37
 Asp Glu Ala Val Ser Lys Tyr Lys Lys Ala Pro Ser Ser Ser Ser Ser
 1 5 10 15

Ser Gly Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
20 25 30
Lys Pro Thr Glu Leu Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val
35 40 45
Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg
50 55 60
Asn Tyr Pro Thr Asn Thr
65 70

<210> 38
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 38
Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser Ser Ser Ser Ser Ser
1 5 10 15
Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
20 25 30
Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val
35 40 45
Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg
50 55 60
Asn Tyr Pro Thr Ile Thr
65 70

<210> 39
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 39
Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser Ser Ser Ser Ser Ser
1 5 10 15
Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn
20 25 30
Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val

35 40 45
 Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg
 50 55 60

Asn Tyr Pro Thr Ile Thr
 65 70

<210> 40
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 40
 Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys
 1 5 10 15

Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Lys Glu Ser Gln Asp
 20 25 30

Glu Glu Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala
 35 40 45

Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu
 50 55 60

Ala Thr Arg Leu Glu Asn
 65 70

<210> 41
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 41
 Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys
 1 5 10 15

Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Lys Glu Ser Gln Asp
 20 25 30

Glu Glu Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala
 35 40 45

Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu
 50 55 60

Ala Thr Arg Leu Glu Asn
65 70

<210> 42
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 42
Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys Val Lys
1 5 10 15

Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Pro Ser Arg Asn
20 25 30

Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser Lys Lys Ala
35 40 45

Glu Ala Thr Arg Leu Glu Glu Ile Lys Thr Glu Arg Lys Lys Ala Glu
50 55 60

Ala Thr Arg Leu Glu Asn
65 70

<210> 43
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 43
Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys Val Lys
1 5 10 15

Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser Arg Asn
20 25 30

Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys Lys Ala
35 40 45

Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu
50 55 60

Ala Thr Arg Leu Glu Asn
65 70

<210> 44
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 44
Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys Val Lys
1 5 10 15
Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser Arg Asn
20 25 30
Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys Lys Ala
35 40 45
Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu
50 55 60
Ala Thr Arg Leu Glu Asn
65 70

<210> 45
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 45
Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys Val Lys
1 5 10 15
Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser Arg Asn
20 25 30
Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys Lys Ala
35 40 45
Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu
50 55 60
Ala Thr Arg Leu Glu Asn
65 70

<210> 46
<211> 70
<212> PRT

<213> Streptococcus pneumoniae

<400> 46

Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys Val Lys
1 5 10 15

Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Phe Arg Asn
20 25 30

Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys Lys Ala
35 40 45

Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu
50 55 60

Ala Thr Arg Leu Glu Asn
65 70

<210> 47

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 47

Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Lys Val Lys
1 5 10 15

Glu Ala Glu Leu Glu Leu Leu Lys Glu Glu Ala Lys Glu Thr Arg Asn
20 25 30

Glu Asp Thr Ile Asn Gln Ala Lys Ala Lys Val Lys Ser Glu Gln Ala
35 40 45

Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Gln Ala Glu
50 55 60

Ala Thr Arg Leu Glu Asn
65 70

<210> 48

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 48

Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys

| | | | |
|---|----|----|----|
| 1 | 5 | 10 | 15 |
| Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Gly Ser Arg Asn | | | |
| 20 | 25 | 30 | |
| Glu Gln Lys Val Asn Gln Ala Lys Ala Lys Val Glu Ser Lys Gln Ala | | | |
| 35 | 40 | 45 | |
| Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Gln Ala Glu | | | |
| 50 | 55 | 60 | |
| Thr Thr Arg Leu Glu Asn | | | |
| 65 | 70 | | |

<210> 49
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

| |
|---|
| <400> 49 |
| Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys Val Lys |
| 1 5 10 15 |
| Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser Arg Asn |
| 20 25 30 |
| Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys Lys Ala |
| 35 40 45 |
| Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu |
| 50 55 60 |
| Ala Thr Arg Leu Glu Asn |
| 65 70 |

<210> 50
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

| |
|---|
| <400> 50 |
| Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys Val Lys |
| 1 5 10 15 |
| Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser Arg Asn |
| 20 25 30 |

Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys Lys Ala
35 40 45

Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu
50 55 60

Ala Thr Arg Leu Glu Asn
65 70

<210> 51
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 51
Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys
1 5 10 15

Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp
20 25 30

Glu Gln Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala
35 40 45

Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu
50 55 60

Ala Thr Arg Leu Glu Asn
65 70

<210> 52
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 52
Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys
1 5 10 15

Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp
20 25 30

Glu Gln Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala
35 40 45

Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu
50 55 60

Ala Thr Arg Leu Glu Asn
65 70

<210> 53

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 53

Ile Lys Thr Asp Arg Glu Lys Ala Glu Glu Ala Lys Arg Lys Ala Asp
1 5 10 15

Ala Lys Leu Lys Glu Ala Val Glu Lys Lys Gln Asn Val Ala Thr Ser
20 25 30

Glu Gln Asp Lys Pro Lys Arg Arg Ala Lys Arg Gly Val Ser Gly Glu
35 40 45

Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
50 55 60

Ser Val Gly Glu Glu Thr
65 70

<210> 54

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 54

Ile Lys Thr Asp Arg Glu Lys Ala Glu Glu Ala Lys Arg Lys Ala Asp
1 5 10 15

Ala Lys Leu Lys Glu Ala Val Glu Lys Lys Gln Asn Val Ala Thr Ser
20 25 30

Glu Gln Asp Lys Pro Lys Arg Arg Ala Lys Arg Gly Val Ser Gly Glu
35 40 45

Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
50 55 60

Ser Val Gly Glu Glu Thr

65

70

<210> 55

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 55

Ile Lys Thr Asp Arg Glu Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu
1 5 10 15

Glu Ser Glu Lys Lys Ala Ala Glu Ala Lys Gln Lys Val Asp Thr Lys
20 25 30

Glu Gln Gly Lys Pro Lys Arg Arg Ala Lys Arg Gly Val Ser Gly Glu
35 40 45

Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
50 55 60

Ser Val Gly Glu Glu Thr
65 70

<210> 56

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 56

Ile Lys Thr Asp Arg Glu Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp
1 5 10 15

Gly Lys Leu Lys Glu Ala Ala Glu Ala Lys Gln Asn Val Ala Thr Ser
20 25 30

Asp Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu
35 40 45

Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
50 55 60

Ser Val Gly Glu Glu Thr
65 70

<210> 57

<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 57
Ile Lys Thr Asp Arg Glu Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp
1 5 10 15
Ala Lys Leu Lys Glu Ala Ala Glu Ala Lys Gln Asn Val Ala Thr Ser
20 25 30
Asp Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu
35 40 45
Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
50 55 60
Ser Val Gly Glu Glu Thr
65 70

<210> 58
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 58
Ile Lys Thr Asp Arg Glu Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp
1 5 10 15
Ala Lys Leu Lys Glu Ala Ala Glu Ala Lys Gln Asn Val Ala Thr Ser
20 25 30
Asp Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu
35 40 45
Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
50 55 60
Ser Val Gly Glu Glu Thr
65 70

<210> 59
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 59
 Ile Lys Thr Asp Arg Glu Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp
 1 5 10 15
 Ala Lys Leu Lys Glu Ala Ala Glu Ala Lys Gln Asn Val Ala Thr Ser
 20 25 30
 Asp Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu
 35 40 45
 Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
 50 55 60
 Ser Val Gly Glu Glu Thr
 65 70

<210> 60
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 60
 Ile Lys Thr Asp Arg Glu Lys Ala Glu Glu Ala Lys Arg Lys Ala Glu
 1 5 10 15
 Ala Glu Glu Val Lys Asp Ala Glu Ala Lys Gln Asn Val Ala Thr Ser
 20 25 30
 Asp Gln Gly Lys Leu Lys Arg Arg Thr Lys Arg Ala Val Pro Gly Glu
 35 40 45
 Pro Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
 50 55 60
 Ser Val Gly Glu Glu Thr
 65 70

<210> 61
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 61
 Ile Lys Thr Asp Arg Glu Lys Ala Glu Glu Ala Lys Arg Lys Ala Asp
 1 5 10 15

Ala Lys Glu Val Gln Asp Ala Glu Ala Lys Gln Asn Val Ala Thr Ser
20 25 30

Asp Gln Gly Glu Ser Lys Arg Arg Val Lys Gly Gly Val Pro Gly Glu
35 40 45

Gln Ala Thr Leu Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
50 55 60

Ser Val Gly Glu Glu Thr
65 70

<210> 62

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 62

Ile Lys Thr Asp Arg Glu Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp
1 5 10 15

Ala Lys Leu Lys Glu Ala Ala Glu Ala Lys Gln Asn Val Ala Thr Ser
20 25 30

Asp Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu
35 40 45

Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
50 55 60

Ser Val Gly Glu Glu Thr
65 70

<210> 63

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 63

Ile Lys Thr Asp Arg Glu Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp
1 5 10 15

Ala Lys Leu Lys Glu Ala Ala Glu Ala Lys Gln Asn Val Ala Thr Ser
20 25 30

Asp Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu

35 40 45
 Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
 50 55 60

Ser Val Gly Glu Glu Thr
 65 70

<210> 64
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 64
 Ile Lys Thr Asp Arg Glu Ala Glu Glu Glu Ala Lys Arg Arg Ala Asp
 1 5 10 15

Ala Lys Glu Lys Glu Ala Ala Glu Ala Lys Gln Asn Val Ala Thr Ser
 20 25 30

Asp Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu
 35 40 45

Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
 50 55 60

Ser Val Gly Glu Glu Thr
 65 70

<210> 65
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 65
 Ile Lys Thr Asp Arg Glu Ala Glu Glu Glu Ala Lys Arg Arg Ala Asp
 1 5 10 15

Ala Lys Glu Lys Glu Ala Ala Glu Ala Lys Gln Asn Val Ala Thr Ser
 20 25 30

Asp Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu
 35 40 45

Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
 50 55 60

Ser Val Gly Glu Glu Thr
65 70

<210> 66
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 66
Leu Pro Ser Pro Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His
1 5 10 15
Arg Lys Asp Val Asp Glu Tyr Ile Lys Lys Met Leu Ser Glu Ile Gln
20 25 30
Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu
35 40 45
Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu
50 55 60
Asn Ser Lys Lys Glu Glu
65 70

<210> 67
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 67
Leu Pro Ser Pro Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His
1 5 10 15
Arg Lys Asp Val Asp Glu Tyr Ile Lys Lys Met Leu Ser Glu Ile Gln
20 25 30
Leu Asp Gly Arg Lys His Thr Pro Asn Val Asn Leu Asn Ile Lys Leu
35 40 45
Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu
50 55 60
Asn Ser Lys Lys Glu Glu
65 70

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<210> 68
<211> 70
<212> PRT
<213> Streptococcus pneumoniae
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<400> 68
Leu Pro Ser Pro Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His
1 5 10 15
Arg Lys Asp Val Asp Glu Tyr Ile Lys Lys Met Leu Ser Glu Ile Gln
20 25 30
Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu
35 40 45
Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu
50 55 60
Asn Ser Lys Lys Glu Glu
65 70

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<210> 69
<211> 70
<212> PRT
<213> Streptococcus pneumoniae
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<400> 69
Leu Pro Ser Ser Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His
1 5 10 15
Arg Lys Asp Val Asp Glu Tyr Ile Lys Lys Met Leu Ser Glu Ile Gln
20 25 30
Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu
35 40 45
Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu
50 55 60
Asn Ser Lys Lys Glu Glu
65 70

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<210> 70
<211> 70
<212> PRT
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<213> Streptococcus pneumoniae

<400> 70

Leu Pro Ser Ser Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His
1 5 10 15
Arg Lys Asp Val Asp Glu Tyr Glu Lys Lys Met Leu Ser Glu Ile Gln
20 25 30
Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu
35 40 45
Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu
50 55 60
Asn Ser Lys Lys Glu Glu
65 70

<210> 71

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 71

Leu Pro Ser Ser Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His
1 5 10 15
Arg Lys Asp Val Asp Glu Tyr Glu Lys Lys Met Leu Ser Glu Ile Gln
20 25 30
Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu
35 40 45
Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu
50 55 60
Asn Ser Lys Lys Glu Glu
65 70

<210> 72

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 72

Leu Pro Ser Ser Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His

| | | | |
|---|----|----|----|
| 1 | 5 | 10 | 15 |
| Arg Lys Asp Val Asp Glu Tyr Glu Lys Lys Met Leu Ser Glu Ile Gln | | | |
| 20 | 25 | 30 | |
| Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu | | | |
| 35 | 40 | 45 | |
| Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu | | | |
| 50 | 55 | 60 | |
| Asn Ser Lys Lys Glu Glu | | | |
| 65 | 70 | | |

<210> 73
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

| |
|---|
| <400> 73 |
| Leu Pro Ser Pro Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His |
| 1 5 10 15 |
| Arg Lys Asp Val Asp Glu Tyr Glu Lys Lys Met Leu Ser Glu Ile Gln |
| 20 25 30 |
| Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu |
| 35 40 45 |
| Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu |
| 50 55 60 |
| Asn Ser Lys Lys Glu Glu |
| 65 70 |

<210> 74
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

| |
|---|
| <400> 74 |
| Leu Pro Ser Pro Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His |
| 1 5 10 15 |
| Arg Lys Asp Val Asp Glu Tyr Glu Lys Lys Met Leu Ser Glu Ile Gln |
| 20 25 30 |

Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu
 35 40 45

Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu
 50 55 60

Asn Ser Lys Lys Glu Glu
 65 70

<210> 75
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 75
 Leu Pro Ser Ser Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His
 1 5 10 15

Arg Lys Asp Val Asp Glu Tyr Glu Lys Lys Met Leu Ser Glu Ile Gln
 20 25 30

Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu
 35 40 45

Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu
 50 55 60

Asn Ser Lys Lys Glu Glu
 65 70

<210> 76
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 76
 Leu Pro Ser Ser Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His
 1 5 10 15

Arg Lys Asp Val Asp Glu Tyr Glu Lys Lys Met Leu Ser Glu Ile Gln
 20 25 30

Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu
 35 40 45

Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu
50 55 60

Asn Ser Lys Lys Glu Glu
65 70

<210> 77

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 77

Leu Pro Ser Pro Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His
1 5 10 15

Arg Lys Asp Val Asp Glu Tyr Glu Lys Lys Met Leu Ser Glu Ile Gln
20 25 30

Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu
35 40 45

Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu
50 55 60

Asn Ser Lys Lys Glu Glu
65 70

<210> 78

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 78

Leu Pro Ser Pro Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His
1 5 10 15

Arg Lys Asp Val Asp Glu Tyr Glu Lys Lys Met Leu Ser Glu Ile Gln
20 25 30

Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu
35 40 45

Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu
50 55 60

Asn Ser Lys Lys Glu Glu

65

70

<210> 79

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 79

Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
1 5 10 15

Lys Lys Asp Thr Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys
20 25 30

Lys Val Glu Glu Ala Lys Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
35 40 45

Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile
50 55 60

Ala Glu Ser Asp Val Lys
65 70

<210> 80

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 80

Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
1 5 10 15

Lys Lys Asp Thr Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys
20 25 30

Lys Val Glu Glu Ala Lys Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
35 40 45

Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile
50 55 60

Ala Glu Ser Asp Val Lys
65 70

<210> 81

<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 81
Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
1 5 10 15
Lys Lys Asp Thr Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys
20 25 30
Lys Val Glu Glu Ala Lys Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
35 40 45
Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile
50 55 60
Ala Glu Ser Asp Val Lys
65 70

<210> 82
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 82
Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
1 5 10 15
Lys Lys Asp Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys
20 25 30
Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
35 40 45
Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile
50 55 60
Ala Glu Ser Asp Val Lys
65 70

<210> 83
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 83

Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
1 5 10 15

Lys Lys Asp Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys
20 25 30

Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
35 40 45

Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile
50 55 60

Ala Glu Ser Asp Val Lys
65 70

<210> 84

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 84

Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
1 5 10 15

Lys Lys Asp Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys
20 25 30

Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
35 40 45

Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile
50 55 60

Ala Glu Ser Asp Val Lys
65 70

<210> 85

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 85

Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
1 5 10 15

Lys Lys Asp Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys
20 25 30

Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
35 40 45

Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile
50 55 60

Ala Glu Ser Asp Val Lys
65 70

<210> 86

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 86

Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
1 5 10 15

Lys Lys Asp Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Gln Lys
20 25 30

Lys Val Ala Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
35 40 45

Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile
50 55 60

Ala Glu Ser Asp Val Lys
65 70

<210> 87

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 87

Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
1 5 10 15

Lys Lys Asp Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys
20 25 30

Lys Val Ala Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp

35 40 45
 Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile
 50 55 60

Ala Glu Ser Asp Val Lys
 65 70

<210> 88
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 88
 Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
 1 5 10 15

Lys Lys Asp Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys
 20 25 30

Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
 35 40 45

Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile
 50 55 60

Ala Glu Ser Asp Val Lys
 65 70

<210> 89
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 89
 Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
 1 5 10 15

Lys Lys Asp Ser Leu Lys Ser Glu Lys Lys Val Ala Glu Ala Glu Lys
 20 25 30

Lys Val Glu Glu Ala Lys Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
 35 40 45

Tyr Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile
 50 55 60

Ala Glu Ser Asp Val Glu
65 70

<210> 90
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 90
Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
1 5 10 15

Lys Lys Asp Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys
20 25 30

Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp
35 40 45

Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile
50 55 60

Ala Glu Ser Asp Val Glu
65 70

<210> 91
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 91
Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe
1 5 10 15

Lys Lys Asp Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys
20 25 30

Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp
35 40 45

Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile
50 55 60

Ala Glu Ser Asp Val Glu
65 70

<210> 92
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 92
Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Asn Glu Ser
1 5 10 15
Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys
20 25 30
Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys
35 40 45
Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys Lys Ala
50 55 60
Ala Glu Ala Lys Gln Lys
65 70

<210> 93
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 93
Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Asn Glu Ser
1 5 10 15
Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys
20 25 30
Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys
35 40 45
Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys Lys Ala
50 55 60
Ala Glu Ala Lys Gln Lys
65 70

<210> 94
<211> 70
<212> PRT

<213> Streptococcus pneumoniae

<400> 94

Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Asn Glu Ser
1 5 10 15

Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys
20 25 30

Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys
35 40 45

Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys Lys Ala
50 55 60

Ala Glu Ala Lys Gln Lys
65 70

<210> 95

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 95

Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro
1 5 10 15

Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser Lys
20 25 30

Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys
35 40 45

Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Lys Ala
50 55 60

Ala Glu Ala Lys Gln Lys
65 70

<210> 96

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 96

Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro

1 5 10 15
 Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser Lys
 20 25 30
 Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys
 35 40 45
 Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Lys Ala
 50 55 60
 Ala Glu Ala Lys Gln Lys
 65 70

<210> 97
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 97
 Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro
 1 5 10 15
 Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser Lys
 20 25 30
 Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys
 35 40 45
 Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Lys Ala
 50 55 60
 Ala Glu Ala Lys Gln Lys
 65 70

<210> 98
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 98
 Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro
 1 5 10 15
 Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser Lys
 20 25 30

Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys
35 40 45

Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Lys Ala
50 55 60

Ala Glu Ala Lys Gln Lys
65 70

<210> 99
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 99
Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser
1 5 10 15

Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Lys Val Glu Ser Lys
20 25 30

Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys
35 40 45

Ala Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp Lys Lys Ala
50 55 60

Ala Glu Ala Lys Gln Lys
65 70

<210> 100
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 100
Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser
1 5 10 15

Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys
20 25 30

Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys
35 40 45

Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Lys Ala
50 55 60

Ala Glu Ala Lys Gln Lys
65 70

<210> 101

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 101

Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro
1 5 10 15

Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser Lys
20 25 30

Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys
35 40 45

Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Lys Ala
50 55 60

Ala Glu Ala Lys Gln Lys
65 70

<210> 102

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 102

Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro
1 5 10 15

Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Lys Val Glu Ser Glu
20 25 30

Glu Thr Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys
35 40 45

Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Lys Ala
50 55 60

Ala Glu Ala Lys Gln Lys

65

70

<210> 103

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 103

Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro
1 5 10 15

Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys
20 25 30

Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys
35 40 45

Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Lys Ala
50 55 60

Ala Glu Ala Lys Gln Lys
65 70

<210> 104

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 104

Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro
1 5 10 15

Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys
20 25 30

Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys
35 40 45

Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Lys Ala
50 55 60

Ala Glu Ala Lys Gln Lys
65 70

<210> 105

<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 105
Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
1 5 10 15
Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
20 25 30
Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser
35 40 45
Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
50 55 60
Asp Lys Ile Asp Glu Leu
65 70

<210> 106
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 106
Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
1 5 10 15
Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
20 25 30
Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser
35 40 45
Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
50 55 60
Asp Lys Ile Asp Glu Leu
65 70

<210> 107
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 107

Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
1 5 10 15

Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
20 25 30

Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser
35 40 45

Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
50 55 60

Asp Lys Ile Asp Glu Leu
65 70

<210> 108

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 108

Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
1 5 10 15

Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
20 25 30

Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser
35 40 45

Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
50 55 60

Asp Lys Ile Asp Glu Leu
65 70

<210> 109

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 109

Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
1 5 10 15

Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
 20 25 30
 Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser
 35 40 45
 Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
 50 55 60
 Asp Lys Ile Asp Glu Leu
 65 70

<210> 110
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 110
 Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
 1 5 10 15
 Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
 20 25 30
 Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser
 35 40 45
 Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
 50 55 60
 Asp Lys Ile Asp Glu Leu
 65 70

<210> 111
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 111
 Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
 1 5 10 15
 Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
 20 25 30
 Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser

35 40 45
 Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
 50 55 60

Asp Lys Ile Asp Glu Leu
 65 70

<210> 112
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 112
 Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
 1 5 10 15

Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
 20 25 30

Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser
 35 40 45

Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
 50 55 60

Asp Lys Ile Asp Glu Leu
 65 70

<210> 113
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 113
 Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
 1 5 10 15

Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
 20 25 30

Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser
 35 40 45

Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
 50 55 60

Asp Lys Ile Asp Glu Leu
65 70

<210> 114
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 114
Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
1 5 10 15

Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
20 25 30

Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser
35 40 45

Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
50 55 60

Asp Lys Ile Asp Glu Leu
65 70

<210> 115
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 115
Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
1 5 10 15

Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
20 25 30

Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser
35 40 45

Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
50 55 60

Asp Lys Ile Asp Glu Leu
65 70

<210> 116
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 116
Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
1 5 10 15
Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
20 25 30
Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser
35 40 45
Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
50 55 60
Asp Lys Ile Asp Glu Leu
65 70

<210> 117
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 117
Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu
1 5 10 15
Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser
20 25 30
Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser
35 40 45
Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser
50 55 60
Asp Lys Ile Asp Glu Leu
65 70

<210> 118
<211> 70
<212> PRT

<213> Streptococcus pneumoniae

<400> 118

Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly
1 5 10 15
Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr
20 25 30
Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Leu Lys Lys
35 40 45
Ala Val Asp Glu Pro Glu Thr Pro Ala Pro Ala Pro Gln Pro Ala Pro
50 55 60
Ala Pro Glu Lys Pro Ala
65 70

<210> 119

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 119

Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly
1 5 10 15
Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr
20 25 30
Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Leu Lys Lys
35 40 45
Ala Val Asp Glu Pro Glu Thr Pro Ala Pro Ala Pro Gln Pro Ala Pro
50 55 60
Ala Pro Glu Lys Pro Ala
65 70

<210> 120

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 120

Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly

| | | | |
|---|----|----|----|
| 1 | 5 | 10 | 15 |
| Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr | | | |
| 20 | 25 | 30 | |
| Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Leu Lys Lys | | | |
| 35 | 40 | 45 | |
| Ala Val Asp Glu Pro Glu Thr Pro Ala Pro Ala Pro Gln Pro Ala Pro | | | |
| 50 | 55 | 60 | |
| Ala Pro Glu Lys Pro Ala | | | |
| 65 | 70 | | |

<210> 121
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

| |
|---|
| <400> 121 |
| Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly |
| 1 5 10 15 |
| Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr |
| 20 25 30 |
| Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Val Lys Glu |
| 35 40 45 |
| Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Thr Gln Pro Ala Pro |
| 50 55 60 |
| Ala Pro Glu Lys Pro Ala |
| 65 70 |

<210> 122
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

| |
|---|
| <400> 122 |
| Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly |
| 1 5 10 15 |
| Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr |
| 20 25 30 |

Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Val Lys Glu Lys
35 40 45

Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Thr Gln Pro Pro Ala Pro
50 55 60

Ala Pro Glu Lys Pro Ala
65 70

<210> 123

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 123

Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly
1 5 10 15

Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr
20 25 30

Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Val Lys Glu Lys
35 40 45

Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Thr Gln Pro Pro Ala Pro
50 55 60

Ala Pro Glu Lys Pro Ala
65 70

<210> 124

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 124

Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly
1 5 10 15

Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr
20 25 30

Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Val Lys Glu Lys
35 40 45

Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Thr Gln Pro Pro Ala Pro
50 55 60

Ala Pro Glu Lys Pro Ala
65 70

<210> 125

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 125

Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly
1 5 10 15

Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr
20 25 30

Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Val Lys Glu
35 40 45

Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys
50 55 60

Pro Thr Glu Glu Pro Glu
65 70

<210> 126

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 126

Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly
1 5 10 15

Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr
20 25 30

Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Val Val Lys
35 40 45

Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Lys
50 55 60

Pro Thr Glu Glu Pro Glu

65

70

<210> 127

<211> 69

<212> PRT

<213> Streptococcus pneumoniae

<400> 127

Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly
1 5 10 15

Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr
20 25 30

Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Val Lys Glu Lys
35 40 45

Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Thr Gln Pro Pro Lys Pro
50 55 60

Thr Glu Glu Pro Glu
65

<210> 128

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 128

Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly
1 5 10 15

Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr
20 25 30

Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Val Lys Glu
35 40 45

Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Thr Gln Pro Pro Lys
50 55 60

Pro Thr Glu Glu Pro Glu
65 70

<210> 129

<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 129

Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly
1 5 10 15

Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr
20 25 30

Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Val Lys Glu
35 40 45

Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Pro Lys
50 55 60

Pro Thr Glu Glu Pro Glu
65 70

<210> 130
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 130

Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly
1 5 10 15

Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr
20 25 30

Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Val Lys Glu
35 40 45

Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Pro Lys
50 55 60

Pro Thr Glu Glu Pro Glu
65 70

<210> 131
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 131

Glu Lys Pro Ala Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro
1 5 10 15

Glu Lys Pro Ala Pro Ala Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln
20 25 30

Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Glu Lys Pro Ala
35 40 45

Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Thr
50 55 60

Pro Glu Thr Pro Lys Thr
65 70

<210> 132

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 132

Glu Lys Pro Ala Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro
1 5 10 15

Glu Lys Pro Ala Pro Ala Pro Lys Ala Glu Lys Thr Asp Asp Glu Lys
20 25 30

Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala
35 40 45

Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala
50 55 60

Pro Lys Pro Glu Thr Pro
65 70

<210> 133

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 133

Glu Lys Pro Ala Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro
1 5 10 15

Glu Lys Pro Ala Glu Lys Pro Lys Ala Glu Lys Thr Asp Asp Glu Lys
 20 25 30

Pro Ala Pro Ala Glu Lys Pro Ala Glu Glu Pro Ala Glu Lys Pro Ala
 35 40 45

Pro Ala Pro Glu Lys Pro Ala Pro Thr Pro Glu Lys Pro Ala Pro Thr
 50 55 60

Pro Glu Thr Pro Lys Thr
 65 70

<210> 134

<211> 67

<212> PRT

<213> Streptococcus pneumoniae

<400> 134

Glu Lys Pro Ala Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Lys Pro
 1 5 10 15

Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln
 20 25 30

Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
 35 40 45

Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr
 50 55 60

Pro Lys Thr
 65

<210> 135

<211> 67

<212> PRT

<213> Streptococcus pneumoniae

<400> 135

Glu Lys Pro Ala Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Lys Pro
 1 5 10 15

Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln
 20 25 30

Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu

35 40 45
 Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr
 50 55 60

Pro Lys Thr
 65

<210> 136
 <211> 67
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 136
 Glu Lys Pro Ala Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Lys Pro
 1 5 10 15

Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln
 20 25 30

Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
 35 40 45

Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr
 50 55 60

Pro Lys Thr
 65

<210> 137
 <211> 67
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 137
 Glu Lys Pro Ala Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Lys Pro
 1 5 10 15

Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln
 20 25 30

Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
 35 40 45

Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr
 50 55 60

Pro Lys Thr
65

<210> 138
<211> 67
<212> PRT
<213> Streptococcus pneumoniae

<400> 138
Asn Pro Ala Ala Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Lys Pro
1 5 10 15
Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln
20 25 30
Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
35 40 45
Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr
50 55 60

Pro Lys Thr
65

<210> 139
<211> 64
<212> PRT
<213> Streptococcus pneumoniae

<400> 139
Asn Pro Ala Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro Lys Pro
1 5 10 15
Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln
20 25 30
Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
35 40 45
Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr
50 55 60

<210> 140

<211> 67

<212> PRT

<213> Streptococcus pneumoniae

<400> 140

Asn Pro Ala Ala Pro Ala Pro Glu Lys Pro Ala Pro Lys Pro Lys Pro
1 5 10 15

Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln
20 25 30

Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
35 40 45

Ile Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Phe Thr
50 55 60

Pro Lys Thr
65

<210> 141

<211> 67

<212> PRT

<213> Streptococcus pneumoniae

<400> 141

Asn Pro Ala Ala Pro Ala Pro Glu Lys Pro Ala Pro Lys Pro Lys Pro
1 5 10 15

Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Glu Gln Gln
20 25 30

Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
35 40 45

Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr
50 55 60

Pro Lys Thr
65

<210> 142

<211> 67

<212> PRT

<213> Streptococcus pneumoniae

<400> 142

Asn Pro Ala Ala Pro Lys Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro
1 5 10 15
Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln
20 25 30
Ala Glu Glu Glu Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
35 40 45
Thr Leu Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr
50 55 60
Pro Lys Thr
65

<210> 143

<211> 65

<212> PRT

<213> Streptococcus pneumoniae

<400> 143

Asn Pro Ala Ala Pro Lys Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro
1 5 10 15
Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln
20 25 30
Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
35 40 45
Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr
50 55 60
Pro
65

<210> 144

<211> 589

<212> PRT

<213> Streptococcus pneumoniae

<400> 144

Glu Gly Val Arg Ser Gly Asn Asn Leu Thr Val Thr Ser Ser Gly Gln

| | | | |
|---|-----|-----|-----|
| 1 | 5 | 10 | 15 |
| Asp Ile Ser Lys Lys Tyr Ala Asp Glu Val Glu Ser His Leu Glu Ser | 20 | 25 | 30 |
| Ile Leu Lys Asp Val Lys Lys Asn Leu Lys Lys Val Gln His Thr Gln | 35 | 40 | 45 |
| Asn Val Gly Leu Ile Thr Lys Leu Ser Glu Ile Lys Lys Lys Tyr Leu | 50 | 55 | 60 |
| Tyr Asp Leu Lys Val Asn Val Leu Ser Glu Ala Glu Leu Thr Ser Lys | 65 | 70 | 75 |
| Thr Lys Glu Thr Lys Glu Lys Leu Thr Ala Thr Phe Glu Gln Phe Lys | 85 | 90 | 95 |
| Lys Asp Thr Leu Pro Thr Glu Pro Glu Lys Lys Val Ala Glu Ala Gln | 100 | 105 | 110 |
| Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys | 115 | 120 | 125 |
| Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu | 130 | 135 | 140 |
| Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val | 145 | 150 | 155 |
| Lys Val Lys Ala Lys Glu Ser Gln Asp Glu Glu Lys Ile Lys Gln Ala | 165 | 170 | 175 |
| Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys | 180 | 185 | 190 |
| Ile Lys Thr Asp Arg Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu | 195 | 200 | 205 |
| Lys Glu Ala Val Glu Lys Asn Val Ala Thr Ser Glu Gln Asp Lys Pro | 210 | 215 | 220 |
| Lys Arg Arg Ala Lys Arg Gly Val Ser Gly Glu Leu Ala Thr Pro Asp | 225 | 230 | 235 |
| Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu | 245 | 250 | 255 |
| Thr Leu Pro Ser Pro Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu | | | |

| | | |
|---|-----|-----|
| 260 | 265 | 270 |
| His Arg Lys Asp Val Asp Glu Tyr Ile Lys Lys Met Leu Ser Glu Ile | | |
| 275 | 280 | 285 |
| Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Asn Leu Asn Ile Lys | | |
| 290 | 295 | 300 |
| Leu Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys | | |
| 305 | 310 | 315 |
| Glu Asn Ser Lys Lys Glu Glu Leu Thr Ser Lys Thr Lys Ala Glu Leu | | |
| | 325 | 330 |
| | | 335 |
| Thr Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Lys Pro Glu Lys | | |
| | 340 | 345 |
| | | 350 |
| Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys Lys Lys Ala | | |
| | 355 | 360 |
| | | 365 |
| Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr | | |
| | 370 | 375 |
| | | 380 |
| Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Lys Val Lys Glu | | |
| 385 | 390 | 395 |
| | | 400 |
| Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Asn Glu Ser Arg Asn Glu | | |
| | 405 | 410 |
| | | 415 |
| Glu Lys Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys Lys Ala Glu | | |
| | 420 | 425 |
| | | 430 |
| Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu | | |
| | 435 | 440 |
| | | 445 |
| Glu Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys Lys Ala Ala Glu Ala | | |
| | 450 | 455 |
| | | 460 |
| Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala | | |
| 465 | 470 | 475 |
| | | 480 |
| Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile | | |
| | 485 | 490 |
| | | 495 |
| Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro | | |
| | 500 | 505 |
| | | 510 |
| Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu | | |

| | | |
|---|-----|-----|
| 515 | 520 | 525 |
| Glu Leu Ser Asp Lys Ile Asp Glu Leu Asp Ala Glu Ile Ala Lys Leu | | |
| 530 | 535 | 540 |
| Glu Val Gln Leu Lys Asp Ala Glu Gly Asn Asn Asn Val Glu Ala Tyr | | |
| 545 | 550 | 555 |
| | | 560 |
| Phe Lys Glu Gly Leu Glu Lys Thr Thr Ala Glu Lys Lys Ala Glu Leu | | |
| | 565 | 570 |
| | | 575 |
| Glu Lys Ala Glu Ala Asp Leu Lys Lys Ala Val Asp Glu | | |
| 580 | 585 | |

<210> 145
 <211> 21
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 145
 Lys Thr Gly Trp Lys Gln Glu Asn Gly Asn Trp Tyr Phe Tyr Asn Thr
 1 5 10 15
 Asp Gly Ser Met Ala
 20

<210> 146
 <211> 20
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 146
 Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Met
 1 5 10 15
 Gly Ala Met Ala
 20

<210> 147
 <211> 20
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 147
 Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn

| | | | |
|---|---|----|----|
| 1 | 5 | 10 | 15 |
|---|---|----|----|

Gly Ser Met Ala
20

<210> 148
 <211> 20
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 148
 Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
 1 5 10 15

Gly Ala Met Ala
20

<210> 149
 <211> 20
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 149
 Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
 1 5 10 15

Gly Asp Met Ala
20

<210> 150
 <211> 20
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 150
 Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn
 1 5 10 15

Gly Ala Met Ala
20

<210> 151
 <211> 20
 <212> PRT

<213> Streptococcus pneumoniae

<400> 151

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Gly | Trp | Leu | Gln | Tyr | Asn | Gly | Ser | Trp | Tyr | Tyr | Leu | Asn | Ala | Asn |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |

Gly Asp Met Ala
20

<210> 152

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 152

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Gly | Trp | Leu | Gln | Asn | Asn | Gly | Ser | Trp | Tyr | Tyr | Leu | Asn | Ala | Asn |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |

Gly Asp Met Ala
20

<210> 153

<211> 19

<212> PRT

<213> Streptococcus pneumoniae

<400> 153

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Gly | Trp | Leu | Gln | Tyr | Asn | Ser | Trp | Tyr | Tyr | Leu | Asn | Ala | Asn | Gly |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |

Asp Met Ala

<210> 154

<211> 21

<212> PRT

<213> Streptococcus pneumoniae

<400> 154

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Gly | Trp | Val | Lys | Asp | Gly | Asp | Thr | Trp | Tyr | Tyr | Leu | Glu | Ala | Ser |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |

Gly Ala Met Lys Ala
20

<210> 155

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 155

Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser

1

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10

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Gly Ala Leu Ala

20

<210> 156

<211> 18

<212> PRT

<213> Streptococcus pneumoniae

<400> 156

Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn Ala Asn Gly Glu Trp

1

5

10

15

Val Asn

<210> 157

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 157

Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn

1

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10

15

Gly Ala Met Ala

20

<210> 158

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 158

Thr Gly Trp Leu Gln Xaa Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn

1

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10

15

Gly Ala Met Ala
20

<210> 159
<211> 17
<212> PRT
<213> Streptococcus pneumoniae

<400> 159
Val Asn Thr Thr Val Asp Gly Tyr Lys Val Asn Ala Asn Gly Glu Trp
1 5 10 15

Val

<210> 160
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 160
Ile Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp
1 5 10 15

Gly Ser Met Ala
20

<210> 161
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 161
Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn
1 5 10 15

Gly Ala Met Ala
20

<210> 162
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 162

Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
1 5 10 15

Gly Ala Met Ala
20

<210> 163

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 163

Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
1 5 10 15

Gly Ala Met Ala
20

<210> 164

<211> 21

<212> PRT

<213> Streptococcus pneumoniae

<400> 164

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<210> 165

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 165

Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
1 5 10 15

Gly Asp Met Ala
20

<210> 166

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 166

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Gly | Trp | Ala | Lys | Val | His | Gly | Ser | Trp | Tyr | Tyr | Leu | Asn | Ala | Asn |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |

| | | | |
|-----|-----|-----|-----|
| Gly | Ser | Met | Ala |
| | | | 20 |

<210> 167

<211> 21

<212> PRT

<213> Streptococcus pneumoniae

<400> 167

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Gly | Trp | Val | Lys | Asp | Gly | Glu | Thr | Trp | Tyr | Tyr | Leu | Glu | Ala | Ser |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |

| | | | | |
|-----|-----|-----|-----|-----|
| Gly | Ser | Met | Lys | Ala |
| | | | | 20 |

<210> 168

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 168

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asn | Gln | Trp | Phe | Gln | Val | Ser | Asp | Lys | Trp | Tyr | Tyr | Val | Asn | Gly | Leu |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |

| | | | |
|-----|-----|-----|-----|
| Gly | Ser | Leu | Ser |
| | | | 20 |

<210> 169

<211> 17

<212> PRT

<213> Streptococcus pneumoniae

<400> 169

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Asn | Thr | Thr | Val | Asp | Gly | Tyr | Lys | Val | Asn | Ala | Asn | Gly | Glu | Trp |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |

Val

<210> 170

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 170

Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn

1

5

10

15

Gly Ser Met Ala

20

<210> 171

<211> 21

<212> PRT

<213> Streptococcus pneumoniae

<400> 171

Lys Thr Gly Trp Lys Gln Glu Asn Gly Asn Trp Tyr Phe Tyr Asn Thr

1

5

10

15

Asp Gly Ser Met Ala

20

<210> 172

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 172

Thr Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp

1

5

10

15

Gly Ser Met Ala

20

<210> 173

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 173

Ile Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp

1

5

10

15

Gly Ser Met Ala
20

<210> 174
<211> 21
<212> PRT
<213> Streptococcus pneumoniae

<400> 174
Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser
1 5 10 15

Gly Ala Met Lys Ala
20

<210> 175
<211> 21
<212> PRT
<213> Streptococcus pneumoniae

<400> 175
Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser
1 5 10 15

Gly Ala Met Lys Ala
20

<210> 176
<211> 21
<212> PRT
<213> Streptococcus pneumoniae

<400> 176
Thr Gly Trp Val Lys Asp Gly Glu Thr Trp Tyr Tyr Leu Glu Ala Ser
1 5 10 15

Gly Ser Met Lys Ala
20

<210> 177
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 177

Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser
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Gly Ala Leu Ala
20

<210> 178

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 178

Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Leu
1 5 10 15

Gly Ala Leu Ala
20

<210> 179

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 179

Asn Gln Trp Phe Gln Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Leu
1 5 10 15

Gly Ser Leu Ser
20

<210> 180

<211> 18

<212> PRT

<213> Streptococcus pneumoniae

<400> 180

Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn Ala Asn Gly Glu Trp
1 5 10 15

Val Asn

<210> 181
<211> 17
<212> PRT
<213> Streptococcus pneumoniae

<400> 181
Val Asn Thr Thr Val Asp Gly Tyr Lys Val Asn Ala Asn Gly Glu Trp
1 5 10 15

Val

<210> 182
<211> 17
<212> PRT
<213> Streptococcus pneumoniae

<400> 182
Val Asn Thr Thr Val Asp Gly Tyr Lys Val Asn Ala Asn Gly Glu Trp
1 5 10 15

Val

<210> 183
<211> 539
<212> PRT
<213> Streptococcus pneumoniae

<400> 183
Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly
20 25 30

Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr
35 40 45

Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val
50 55 60

Val Asp Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu Asp Arg
65 70 75 80

Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile

| 85 | | | | | 90 | | | | | 95 | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Thr | Lys | Tyr | Leu | Arg | Glu | Leu | Asn | Val | Leu | Glu | Glu | Lys | Ser | Lys |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Asp | Glu | Leu | Pro | Ser | Glu | Ile | Lys | Ala | Lys | Leu | Asp | Ala | Ala | Phe | Glu |
| | | 115 | | | | | 120 | | | | | 125 | | | |
| Lys | Phe | Lys | Lys | Asp | Thr | Leu | Lys | Pro | Gly | Glu | Lys | Val | Ala | Glu | Ala |
| | 130 | | | | | 135 | | | | | 140 | | | | |
| Lys | Lys | Lys | Val | Glu | Glu | Ala | Lys | Lys | Lys | Ala | Glu | Asp | Gln | Lys | Glu |
| 145 | | | | 150 | | | | | 155 | | | | | 160 | |
| Glu | Asp | Arg | Arg | Asn | Tyr | Pro | Thr | Asn | Thr | Tyr | Lys | Thr | Leu | Glu | Leu |
| | | | | 165 | | | | 170 | | | | | 175 | | |
| Glu | Ile | Ala | Glu | Phe | Asp | Val | Lys | Val | Lys | Glu | Ala | Glu | Leu | Glu | Leu |
| | | 180 | | | | | 185 | | | | | | 190 | | |
| Val | Lys | Glu | Glu | Ala | Lys | Glu | Phe | Arg | Asn | Glu | Gly | Thr | Ile | Lys | Gln |
| | 195 | | | | | 200 | | | | | 205 | | | | |
| Ala | Lys | Glu | Lys | Val | Glu | Ser | Lys | Lys | Ala | Glu | Ala | Thr | Arg | Leu | Glu |
| | 210 | | | | | 215 | | | | | 220 | | | | |
| Asn | Ile | Lys | Thr | Asp | Arg | Lys | Lys | Ala | Glu | Glu | Glu | Ala | Lys | Arg | Lys |
| 225 | | | | 230 | | | | | 235 | | | | | 240 | |
| Ala | Ala | Glu | Glu | Asp | Lys | Val | Lys | Glu | Lys | Pro | Ala | Glu | Gln | Pro | Gln |
| | | | 245 | | | | | 250 | | | | | 255 | | |
| Pro | Ala | Pro | Ala | Thr | Gln | Pro | Glu | Lys | Pro | Ala | Pro | Lys | Pro | Glu | Lys |
| | | 260 | | | | | 265 | | | | | 270 | | | |
| Pro | Ala | Glu | Gln | Pro | Lys | Ala | Glu | Lys | Thr | Asp | Asp | Gln | Gln | Ala | Glu |
| | 275 | | | | | 280 | | | | | 285 | | | | |
| Glu | Asp | Tyr | Ala | Arg | Arg | Ser | Glu | Glu | Glu | Tyr | Asn | Arg | Leu | Thr | Gln |
| | 290 | | | | | 295 | | | | | 300 | | | | |
| Gln | Gln | Pro | Pro | Lys | Thr | Glu | Lys | Pro | Ala | Gln | Pro | Ser | Thr | Pro | Lys |
| 305 | | | | 310 | | | | | 315 | | | | | 320 | |
| Thr | Gly | Trp | Lys | Gln | Glu | Asn | Gly | Met | Trp | Tyr | Phe | Tyr | Asn | Thr | Asp |
| | | | 325 | | | | | 330 | | | | | 335 | | |
| Gly | Ser | Met | Ala | Thr | Gly | Trp | Leu | Gln | Asn | Asn | Gly | Ser | Trp | Tyr | Tyr |

| | | |
|---|---------------------|-----------------|
| 340 | 345 | 350 |
| Leu Asn Ala Asn Gly Ala Met | Ala Thr Gly Trp Leu | Gln Asn Asn Gly |
| 355 | 360 | 365 |
| Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met | Ala Thr Gly Trp Leu | |
| 370 | 375 | 380 |
| Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ala Met Ala | | |
| 385 | 390 | 395 400 |
| Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn | | |
| 405 | 410 | 415 |
| Gly Ala Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr | | |
| 420 | 425 | 430 |
| Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Asn Asn Gly | | |
| 435 | 440 | 445 |
| Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu | | |
| 450 | 455 | 460 |
| Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala | | |
| 465 | 470 | 475 480 |
| Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Thr Ser | | |
| 485 | 490 | 495 |
| Gly Ala Met Lys Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr | | |
| 500 | 505 | 510 |
| Tyr Val His Gly Ser Ser Ala Leu Ala Ile Asn Thr Thr Val Tyr Gly | | |
| 515 | 520 | 525 |
| Tyr Gly Val Asn Ala Asn Gly Glu Trp Val Asn | | |
| 530 | 535 | |

<210> 184

<211> 1620

<212> DNA

<213> Streptococcus pneumoniae

<400> 184

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 gaggggaagta cccaagcagc cacttcttct aatatggcaa agacagaaca taggaaagct 180

gctaaacaag tcgtcgatga atatatagaa aaaatgttga gggagattca actagataga 240
agaaaacata cccaaaatgt cgccttaaac ataaagttga ggcgaattaa aacgaagtat 300
ttgcgtgaat taaatgtttt agaagagaag tcgaaagatg agttgccgtc agaaataaaa 360
gcaaagttag acgcagcttt tgagaagttt aaaaaagata cattgaaacc aggagaaaag 420
gtagcagaag ctaagaagaa ggttgaagaa gctaagaaaa aagccgagga tcaaaaagaa 480
gaagatcgtc gtaactaccc aaccaatact tacaaaacgc ttgaacttga aattgctgag 540
ttcgatgtga aagttaaaga agcggagctt gaactagtaa aagaggaagc taaagaattt 600
cgaaacgagg gcacaattaa gcaagcaaaa gagaaagttg agagtaaaaa agctgaggct 660
acaagggttag aaacatcaa gacagatcgt aaaaaagcag aagaagaagc taaacgaaaa 720
gcagcagaag aagataaagt taaagaaaaa ccagctgaac aaccacaacc agcgccggct 780
actcaaccag aaaaaccagc tccaaaacca gagaagccag ctgaacaacc aaaagcagaa 840
aaaacagatg atcaacaagc tgaagaagac tatgctcgta gatcagaaga agaataataat 900
cgcttgactc aacagcaacc gccaaaaact gaaaaaccag cacaaccatc tactccaaaa 960
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gcaagccaat ggttcaaagt atcagataaa tgggtactatg tccatggctc aagtgccctt 1560
gcaatcaaca caactgtata tggctatgga gtcaatgcc aatggtgaatg ggtaaactaa 1620

<210> 185

<211> 581

<212> PRT

<213> Streptococcus pneumoniae

<400> 185

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
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Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly
20 25 30

Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr
35 40 45

Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val
50 55 60

Val Asp Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu Asp Arg
65 70 75 80

Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile
85 90 95

Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys Ser Lys
 100 105 110

Asp Glu Leu Pro Ser Glu Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu
 115 120 125

Lys Phe Lys Lys Asp Thr Leu Lys Pro Gly Glu Lys Val Ala Glu Ala
 130 135 140

Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu
 145 150 155 160

Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu
 165 170 175

Glu Ile Ala Glu Phe Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu
 180 185 190

Val Lys Glu Glu Ala Lys Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln
 195 200 205

Ala Lys Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu
 210 215 220

Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys
 225 230 235 240

Ala Asp Ala Lys Leu Lys Glu Ala Asn Val Ala Thr Ser Asp Gln Gly
 245 250 255

Lys Pro Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu Leu Ala Thr
 260 265 270

Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly
 275 280 285

Glu Glu Thr Leu Pro Ser Ser Ser Leu Lys Ser Gly Lys Lys Val Ala
 290 295 300

Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln
 305 310 315 320

Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu
 325 330 335

Asp Leu Glu Ile Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu
 340 345 350

Glu Leu Val Lys Glu Glu Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile
 355 360 365

Lys Gln Ala Lys Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg
 370 375 380

Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys
 385 390 395 400

Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln
 405 410 415

Pro Gln Pro Ala Pro Ala Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro
 420 425 430

Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln
 435 440 445

Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
 450 455 460

Ile Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Phe Thr
 465 470 475 480

Pro Lys Thr Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn
 485 490 495

Thr Asp Gly Ser Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp
 500 505 510

Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Val Lys Asp
 515 520 525

Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys Ala Ser
 530 535 540

Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser Gly
 545 550 555 560

Ala Leu Ala Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn Ala Asn
 565 570 575

Gly Glu Trp Val Asn
 580

<210> 186

<211> 1746

<212> DNA

<213> Streptococcus pneumoniae

<400> 186

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gctaaacaag tcgtcgatga atatatagaa aaaatggtga gggagattca actagataga 240
agaaaacata cccaaaatgt cgccttaaac ataaagttga gcgcaattaa aacgaagtat 300
ttgcgtagaat taaatgtttt agaagagaag tcgaaagatg agttgccgtc agaaataaaa 360
gcaaagtttag acgcagcttt tgagaagttt aaaaaagata cattgaaacc aggagaaaag 420
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ttcgatgtga aagttaaaga agcggagctt gaactagtaa aagaggaagc taaagaatct 600
cgaaacgagg gcacaattaa gcaagcaaaa gagaaagttg agagtaaaaa agctgaggct 660
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gaacctcgag acgaggaaaa aattaagcaa gcaaaagcga aagttgagag taaaaaagct 1140
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aactaa 1746
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<210> 187

<211> 663

<212> PRT

<213> Streptococcus pneumoniae

<400> 187

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```

```
Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu
    20                      25                      30
```

| | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|
| Lys | Met | Leu | Arg | Glu | Ile | Gln | Leu | Asp | Arg | Arg | Lys | His | Thr | Gln | Asn | | | |
| | | 35 | | | | | 40 | | | | | 45 | | | | | | |
| Val | Ala | Leu | Asn | Ile | Lys | Leu | Ser | Ala | Ile | Lys | Thr | Lys | Tyr | Leu | Arg | | | |
| | | 50 | | | | 55 | | | | | 60 | | | | | | | |
| Glu | Leu | Asn | Val | Leu | Glu | Glu | Lys | Ser | Lys | Asp | Glu | Leu | Pro | Ser | Glu | | | |
| | | 65 | | | 70 | | | | | 75 | | | | | 80 | | | |
| Ile | Lys | Ala | Lys | Leu | Asp | Ala | Ala | Phe | Glu | Lys | Phe | Lys | Lys | Asp | Thr | | | |
| | | | | 85 | | | | | 90 | | | | | 95 | | | | |
| Leu | Lys | Pro | Gly | Glu | Lys | Val | Ala | Glu | Ala | Lys | Lys | Lys | Val | Glu | Glu | | | |
| | | | 100 | | | | | 105 | | | | | 110 | | | | | |
| Ala | Lys | Lys | Lys | Ala | Glu | Asp | Gln | Lys | Glu | Glu | Asp | Arg | Arg | Asn | Tyr | | | |
| | | | 115 | | | | 120 | | | | | 125 | | | | | | |
| Pro | Thr | Asn | Thr | Tyr | Lys | Thr | Leu | Glu | Leu | Glu | Ile | Ala | Glu | Phe | Asp | | | |
| | | | 130 | | | 135 | | | | | 140 | | | | | | | |
| Val | Lys | Val | Lys | Glu | Ala | Glu | Leu | Glu | Leu | Val | Lys | Glu | Glu | Ala | Lys | | | |
| | | | 145 | | | 150 | | | | 155 | | | | | 160 | | | |
| Glu | Ser | Arg | Asn | Glu | Gly | Thr | Ile | Lys | Gln | Ala | Lys | Glu | Lys | Val | Glu | | | |
| | | | 165 | | | | | 170 | | | | | | 175 | | | | |
| Ser | Lys | Lys | Ala | Glu | Ala | Thr | Arg | Leu | Glu | Asn | Ile | Lys | Thr | Asp | Arg | | | |
| | | | 180 | | | | | 185 | | | | | 190 | | | | | |
| Lys | Lys | Ala | Glu | Glu | Glu | Ala | Lys | Arg | Lys | Ala | Asp | Ala | Lys | Leu | Lys | | | |
| | | | 195 | | | | 200 | | | | 205 | | | | | | | |
| Glu | Ala | Asn | Val | Ala | Thr | Ser | Asp | Gln | Gly | Lys | Pro | Lys | Gly | Arg | Ala | | | |
| | | | 210 | | | 215 | | | | | 220 | | | | | | | |
| Lys | Arg | Gly | Val | Pro | Gly | Glu | Leu | Ala | Thr | Pro | Asp | Lys | Lys | Glu | Asn | | | |
| | | | 225 | | | 230 | | | | 235 | | | | 240 | | | | |
| Asp | Ala | Lys | Ser | Ser | Asp | Ser | Ser | Val | Gly | Glu | Glu | Thr | Leu | Pro | Ser | | | |
| | | | 245 | | | | | 250 | | | | | 255 | | | | | |
| Ser | Ser | Leu | Lys | Ser | Gly | Lys | Lys | Val | Ala | Glu | Ala | Glu | Lys | Lys | Val | | | |
| | | | 260 | | | | | 265 | | | | | 270 | | | | | |
| Glu | Glu | Ala | Glu | Lys | Lys | Ala | Lys | Asp | Gln | Lys | Glu | Glu | Asp | Arg | Arg | | | |
| | | | 275 | | | | 280 | | | | | | 285 | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asn | Tyr | Pro | Thr | Asn | Thr | Tyr | Lys | Thr | Leu | Asp | Leu | Glu | Ile | Ala | Glu | 290 | 295 | 300 | |
| Ser | Asp | Val | Lys | Val | Lys | Glu | Ala | Glu | Leu | Glu | Leu | Val | Lys | Glu | Glu | 305 | 310 | 315 | 320 |
| Ala | Lys | Glu | Pro | Arg | Asp | Glu | Glu | Lys | Ile | Lys | Gln | Ala | Lys | Ala | Lys | 325 | 330 | 335 | |
| Val | Glu | Ser | Lys | Lys | Ala | Glu | Ala | Thr | Arg | Leu | Glu | Asn | Ile | Lys | Thr | 340 | 345 | 350 | |
| Asp | Arg | Lys | Lys | Ala | Glu | Glu | Glu | Ala | Lys | Arg | Lys | Ala | Ala | Glu | Glu | 355 | 360 | 365 | |
| Asp | Lys | Val | Lys | Glu | Lys | Pro | Ala | Glu | Gln | Pro | Gln | Pro | Ala | Pro | Ala | 370 | 375 | 380 | |
| Thr | Gln | Pro | Glu | Lys | Pro | Ala | Pro | Lys | Pro | Glu | Lys | Pro | Ala | Glu | Gln | 385 | 390 | 395 | 400 |
| Pro | Lys | Ala | Glu | Lys | Thr | Asp | Asp | Gln | Gln | Ala | Glu | Glu | Asp | Tyr | Ala | 405 | 410 | 415 | |
| Arg | Arg | Ser | Glu | Glu | Glu | Tyr | Asn | Arg | Leu | Thr | Gln | Gln | Gln | Pro | Pro | 420 | 425 | 430 | |
| Lys | Thr | Glu | Lys | Pro | Ala | Gln | Pro | Ser | Thr | Pro | Lys | Thr | Gly | Trp | Lys | 435 | 440 | 445 | |
| Gln | Glu | Asn | Gly | Met | Trp | Tyr | Phe | Tyr | Asn | Thr | Asp | Gly | Ser | Met | Ala | 450 | 455 | 460 | |
| Thr | Gly | Trp | Leu | Gln | Asn | Asn | Gly | Ser | Trp | Tyr | Tyr | Leu | Asn | Ala | Asn | 465 | 470 | 475 | 480 |
| Gly | Ala | Met | Ala | Thr | Gly | Trp | Leu | Gln | Asn | Asn | Gly | Ser | Trp | Tyr | Tyr | 485 | 490 | 495 | |
| Leu | Asn | Ala | Asn | Gly | Ser | Met | Ala | Thr | Gly | Trp | Leu | Gln | Asn | Asn | Gly | 500 | 505 | 510 | |
| Ser | Trp | Tyr | Tyr | Leu | Asn | Ala | Asn | Gly | Ala | Met | Ala | Thr | Gly | Trp | Leu | 515 | 520 | 525 | |
| Gln | Tyr | Asn | Gly | Ser | Trp | Tyr | Tyr | Leu | Asn | Ser | Asn | Gly | Ala | Met | Ala | 530 | 535 | 540 | |

Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
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Gly Asp Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr
565 570 575

Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly
580 585 590

Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Val
595 600 605

Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys
610 615 620

Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly
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Ala Asn Gly Glu Trp Val Asn
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<212> DNA

<213> Streptococcus pneumoniae

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<210> 189

<211> 929

<212> PRT

<213> Streptococcus pneumoniae

<400> 189

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          20                      25                      30

```

```

Gly Val Val His Ala Glu Gly Val Arg Ser Gly Asn Asn Leu Thr Val
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```

```

Thr Ser Ser Gly Gln Asp Ile Ser Lys Lys Tyr Ala Asp Glu Val Glu
          50                      55                      60

```

```

Ser His Leu Glu Ser Ile Leu Lys Asp Val Lys Lys Asn Leu Lys Lys
          65                      70                      75                      80

```

```

Val Gln His Thr Gln Asn Val Gly Leu Ile Thr Lys Leu Ser Glu Ile

```

| 85 | | | | | 90 | | | | | 95 | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Lys | Lys | Lys | Tyr | Leu | Tyr | Asp | Leu | Lys | Val | Asn | Val | Leu | Ser | Glu | Ala | |
| 100 | | | | | 105 | | | | | 110 | | | | | | |
| Glu | Leu | Thr | Ser | Lys | Thr | Lys | Glu | Thr | Lys | Glu | Lys | Leu | Thr | Ala | Thr | |
| 115 | | | | | 120 | | | | | 125 | | | | | | |
| Phe | Glu | Gln | Phe | Lys | Lys | Asp | Thr | Leu | Pro | Thr | Glu | Pro | Glu | Lys | Lys | |
| 130 | | | | | 135 | | | | | 140 | | | | | | |
| Val | Ala | Glu | Ala | Gln | Lys | Lys | Val | Glu | Glu | Ala | Lys | Lys | Lys | Ala | Glu | |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 | |
| Asp | Gln | Lys | Glu | Lys | Asp | Arg | Arg | Asn | Tyr | Pro | Thr | Ile | Thr | Tyr | Lys | |
| 165 | | | | | 170 | | | | | 175 | | | | | | |
| Thr | Leu | Glu | Leu | Glu | Ile | Ala | Glu | Ser | Asp | Val | Glu | Val | Lys | Lys | Ala | |
| 180 | | | | | 185 | | | | | 190 | | | | | | |
| Glu | Leu | Glu | Leu | Val | Lys | Val | Lys | Ala | Lys | Glu | Ser | Gln | Asp | Glu | Glu | |
| 195 | | | | | 200 | | | | | 205 | | | | | | |
| Lys | Ile | Lys | Gln | Ala | Glu | Ala | Glu | Val | Glu | Ser | Lys | Gln | Ala | Glu | Ala | |
| 210 | | | | | 215 | | | | | 220 | | | | | | |
| Thr | Arg | Leu | Lys | Lys | Ile | Lys | Thr | Asp | Arg | Glu | Glu | Ala | Lys | Arg | Lys | |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 | |
| Ala | Asp | Ala | Lys | Leu | Lys | Glu | Ala | Val | Glu | Lys | Asn | Val | Ala | Thr | Ser | |
| 245 | | | | | 250 | | | | | 255 | | | | | | |
| Glu | Gln | Asp | Lys | Pro | Lys | Arg | Arg | Ala | Lys | Arg | Gly | Val | Ser | Gly | Glu | |
| 260 | | | | | 265 | | | | | 270 | | | | | | |
| Leu | Ala | Thr | Pro | Asp | Lys | Lys | Glu | Asn | Asp | Ala | Lys | Ser | Ser | Asp | Ser | |
| 275 | | | | | 280 | | | | | 285 | | | | | | |
| Ser | Val | Gly | Glu | Glu | Thr | Leu | Pro | Ser | Pro | Ser | Leu | Asn | Met | Ala | Asn | |
| 290 | | | | | 295 | | | | | 300 | | | | | | |
| Glu | Ser | Gln | Thr | Glu | His | Arg | Lys | Asp | Val | Asp | Glu | Tyr | Ile | Lys | Lys | |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 | |
| Met | Leu | Ser | Glu | Ile | Gln | Leu | Asp | Arg | Arg | Lys | His | Thr | Gln | Asn | Val | |
| 325 | | | | | 330 | | | | | 335 | | | | | | |
| Asn | Leu | Asn | Ile | Lys | Leu | Ser | Ala | Ile | Lys | Thr | Lys | Tyr | Leu | Tyr | Glu | |

| | | |
|---|-----|-----|
| 340 | 345 | 350 |
| Leu Ser Val Leu Lys Glu Asn Ser Lys Lys Glu Glu Leu Thr Ser Lys | | |
| 355 | 360 | 365 |
| Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr | | |
| 370 | 375 | 380 |
| Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu | | |
| 385 | 390 | 400 |
| Ala Lys Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr | | |
| 405 | 410 | 415 |
| Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp | | |
| 420 | 425 | 430 |
| Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Asn | | |
| 435 | 440 | 445 |
| Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys Glu Lys Val Glu | | |
| 450 | 455 | 460 |
| Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg | | |
| 465 | 470 | 475 |
| Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys | | |
| 485 | 490 | 495 |
| Lys Ala Ala Glu Ala Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu | | |
| 500 | 505 | 510 |
| Glu Ala Lys Ile Ala Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys | | |
| 515 | 520 | 525 |
| Glu Leu Lys Glu Ile Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu | | |
| 530 | 535 | 540 |
| Gly Leu Arg Ala Pro Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys | | |
| 545 | 550 | 555 |
| Leu Ser Lys Leu Glu Glu Leu Ser Asp Lys Ile Asp Glu Leu Asp Ala | | |
| 565 | 570 | 575 |
| Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly Asn Asn | | |
| 580 | 585 | 590 |
| Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr Ala Glu | | |

| 595 | 600 | 605 |
|-----------------------------|-------------------------|-----------------|
| Lys Lys Ala Glu Leu Glu Lys | Ala Glu Ala Asp Leu Lys | Lys Lys Ala Val |
| 610 | 615 | 620 |
| Asp Glu Pro Glu Thr Pro Ala | Pro Ala Pro Gln Pro Ala | Pro Ala Pro |
| 625 | 630 | 635 640 |
| Glu Lys Pro Ala Glu Lys Pro | Ala Pro Ala Pro Glu Lys | Pro Ala Pro |
| 645 | 650 | 655 |
| Ala Pro Glu Lys Pro Ala Pro | Ala Pro Glu Lys Pro Ala | Pro Ala Pro |
| 660 | 665 | 670 |
| Glu Lys Pro Ala Pro Ala Pro | Glu Lys Pro Ala Pro Thr | Pro Glu Thr |
| 675 | 680 | 685 |
| Pro Lys Thr Gly Trp Lys Gln | Glu Asn Gly Met Trp Tyr | Phe Tyr Asn |
| 690 | 695 | 700 |
| Thr Asp Gly Ser Met Ala Thr | Gly Trp Leu Gln Asn Asn | Gly Ser Trp |
| 705 | 710 | 715 720 |
| Tyr Tyr Leu Asn Ser Asn Gly | Ala Met Ala Thr Gly Trp | Leu Gln Asn |
| 725 | 730 | 735 |
| Asn Gly Ser Trp Tyr Tyr Leu | Asn Ser Asn Gly Ala Met | Ala Thr Gly |
| 740 | 745 | 750 |
| Trp Leu Gln Tyr Asn Gly Ser | Trp Tyr Tyr Leu Asn Ala | Asn Gly Asp |
| 755 | 760 | 765 |
| Met Ala Thr Gly Trp Leu Gln | Tyr Asn Gly Ser Trp Tyr | Tyr Leu Asn |
| 770 | 775 | 780 |
| Ala Asn Gly Asp Met Ala Thr | Gly Trp Phe Gln Tyr Asn | Gly Ser Trp |
| 785 | 790 | 795 800 |
| Tyr Tyr Leu Asn Ala Asn Gly | Asp Met Ala Thr Gly Trp | Phe Gln Tyr |
| 805 | 810 | 815 |
| Asn Gly Ser Trp Tyr Tyr Leu | Asn Ala Asn Gly Asp Met | Ala Thr Gly |
| 820 | 825 | 830 |
| Trp Leu Gln Tyr Asn Gly Ser | Trp Tyr Tyr Leu Asn Ser | Asn Gly Ala |
| 835 | 840 | 845 |
| Met Val Thr Gly Trp Leu Gln | Asn Asn Gly Ser Trp Tyr | Tyr Leu Asn |

| | | | | |
|---|-----------------------------|-------------------------|-----|-----|
| 850 | | 855 | | 860 |
| Ala Asn Gly Ser Met | Ala Thr Asp Trp Val | Lys Asp Gly Asp Thr Trp | | |
| 865 | 870 | 875 | 880 | |
| Tyr Tyr Leu Glu Ala Ser Gly Ala Met | Lys Ala Ser Gln Trp Phe Lys | | | |
| | 885 | 890 | 895 | |
| Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser Gly Ala Leu Ala Val | | | | |
| | 900 | 905 | 910 | |
| Asn Thr Thr Val Asp Ser Tyr Arg Val Asn Ala Asn Gly Glu Trp Val | | | | |
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Asn

<210> 190
 <211> 3463
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 190

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<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 191

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10

15

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20

25

30

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Asp Glu Val Glu Ser Pro
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20 25 30

Ser Val Val His Ala Thr Glu Asn Glu Gly Ile Thr Gln Asn Glu Gly
35 40 45

Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys Thr Glu His Arg
50 55 60

Lys Gln Val Asp Glu Pro
65 70

<210> 195
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 195
Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Leu Gly
20 25 30

Gly Val Val His Ala Glu Gly Val Arg Gly Ile Thr Gln Ser Glu Asn
35 40 45

Thr Pro Lys Val Thr Ser Ser Gly Asn Met Ala Lys Thr Glu His Arg
50 55 60

Lys Gln Val Asp Glu Pro
65 70

<210> 196
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 196
Met Phe Ala Ser Lys Asn Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15
Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Met Gly
20 25 30
Ser Val Val His Ala Thr Gly Val Glu Gly Ile Thr Gln Lys Glu Val
35 40 45
Thr Thr Gln Val Ala Thr Ser Phe Asn Lys Ala Asn Lys Ser Gln Thr
50 55 60
Glu His Met Asp Glu Pro
65 70

<210> 197
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 197
Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15
Phe Ser Val Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly
20 25 30
Ser Val Val His Ala Thr Glu Val Glu Gly Ile Thr Gln Asn Glu Gly
35 40 45
Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn Glu Ser Gln Ala
50 55 60
Glu Gln Gly Glu Gln Pro
65 70

<210> 198
<211> 70
<212> PRT

<213> Streptococcus pneumoniae

<400> 198

Lys Lys Leu Asp Ser His Leu Glu Ser Ile Leu Lys Asp Val Lys Lys
1 5 10 15

Asn Leu Lys Lys Val Gln Ser Glu Ser Tyr Ala Lys Ser Thr Lys Lys
20 25 30

Arg His Thr Gln Asn Val Gly Leu Ile Thr Lys Leu Ser Glu Ile Lys
35 40 45

Lys Lys Tyr Leu Tyr Asp Leu Lys Val Asn Val Leu Ser Glu Ala Glu
50 55 60

Leu Thr Ser Lys Thr Lys
65 70

<210> 199

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 199

Lys Lys Leu Asp Ser His Leu Glu Ser Ile Leu Lys Asp Val Lys Lys
1 5 10 15

Asn Leu Lys Lys Val Gln Ser Glu Ser Tyr Ala Lys Ser Thr Lys Lys
20 25 30

Arg His Thr Gln Asn Val Gly Leu Ile Thr Lys Leu Ser Glu Ile Lys
35 40 45

Lys Lys Tyr Leu Tyr Asp Leu Lys Val Asn Val Leu Ser Glu Ala Glu
50 55 60

Leu Thr Ser Lys Thr Lys
65 70

<210> 200

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 200

Lys Lys Leu Asp Ser Asp Ile Lys Lys Met Leu Ser Glu Ile Gln Glu

| | | | |
|---|----|----|----|
| 1 | 5 | 10 | 15 |
| Tyr Ile Lys Lys Met Leu Ser Glu Ser Tyr Ile Gln Leu Asp Lys Arg | | | |
| 20 | 25 | 30 | |
| Lys His Thr Gln Asn Val Asn Leu Asn Arg Lys Leu Ser Ala Ile Gln | | | |
| 35 | 40 | 45 | |
| Thr Lys Tyr Leu Tyr Glu Leu Arg Val Leu Lys Glu Ser Lys Ser Lys | | | |
| 50 | 55 | 60 | |
| Lys Glu Glu Leu Thr Ser | | | |
| 65 | 70 | | |

<210> 201
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

| |
|---|
| <400> 201 |
| Lys Lys Leu Asp Ser Asp Ile Lys Ala Ala Lys Gln Val Val Asp Glu |
| 1 5 10 15 |
| Tyr Ile Glu Lys Met Leu Arg Glu Ser Tyr Ile Gln Leu Asp Arg Arg |
| 20 25 30 |
| Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys |
| 35 40 45 |
| Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Ser Glu Lys Ser |
| 50 55 60 |
| Lys Asp Glu Leu Pro Ser |
| 65 70 |

<210> 202
 <211> 70
 <212> PRT
 <213> Streptocarpus holstii

| |
|---|
| <400> 202 |
| Lys Lys Leu Asp Ser Asp Ile Lys Ala Ala Lys Asp Glu Val Asp Glu |
| 1 5 10 15 |
| Tyr Ile Lys Lys Met Leu Ser Glu Ser Tyr Ile Gln Leu Asp Lys Arg |
| 20 25 30 |

Lys His Thr His Asn Phe Ala Leu Asn Leu Lys Leu Ser Arg Ile Lys
35 40 45

Thr Glu Tyr Leu Tyr Lys Leu Lys Val Asn Val Leu Glu Glu Lys Ser
50 55 60

Lys Ala Glu Leu Thr Ser
65 70

<210> 203

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 203

Lys Lys Leu Asp Ser Asp Ile Lys Lys Ala Ala Lys Gln Val Asp Glu
1 5 10 15

Tyr Ile Thr Lys Lys Leu Ser Glu Ser Tyr Ile Gln Leu Asp Arg Arg
20 25 30

Lys His Thr Gln Asn Val Gly Leu Leu Thr Lys Leu Gly Val Ile Lys
35 40 45

Thr Glu Tyr Leu His Arg Leu Ser Val Ser Val Leu Lys Glu Lys Ser
50 55 60

Glu Ala Glu Leu Pro Ser
65 70

<210> 204

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 204

Lys Lys Leu Asp Ser Glu Arg Asp Lys Ala Arg Lys Glu Val Glu Glu
1 5 10 15

Tyr Val Lys Lys Ile Val Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys
20 25 30

Arg His Thr Ile Thr Val Ala Leu Val Asn Glu Leu Asn Asn Ile Lys
35 40 45

Asn Glu Tyr Leu Asn Lys Ile Val Glu Ser Val Thr Ser Glu Ser Gln
 50 55 60

Leu Gln Ile Leu Met Met
 65 70

<210> 205

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 205

Glu Thr Lys Glu Lys Leu Thr Ala Thr Phe Glu Gln Phe Lys Lys Asp
 1 5 10 15

Thr Leu Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser
 20 25 30

Asp Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Glu Lys Lys Val Ala
 35 40 45

Glu Ala Gln Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln
 50 55 60

Lys Glu Lys Asp Arg Arg
 65 70

<210> 206

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 206

Glu Thr Lys Glu Lys Leu Thr Ala Thr Phe Glu Gln Phe Lys Lys Asp
 1 5 10 15

Thr Leu Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser
 20 25 30

Asp Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Glu Lys Lys Val Ala
 35 40 45

Glu Ala Gln Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln
 50 55 60

Lys Glu Lys Asp Arg Arg

65

70

<210> 207

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 207

Lys Thr Lys Lys Glu Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Glu
 1 5 10 15

Thr Leu Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser
 20 25 30

Asp Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Glu Lys Lys Val Pro
 35 40 45

Glu Leu Thr Lys Lys Leu Ala Glu Ala Lys Gln Lys Ala Lys Ala Gln
 50 55 60

Lys Glu Glu Asp Phe Arg
 65 70

<210> 208

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 208

Glu Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp
 1 5 10 15

Thr Leu Lys Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser
 20 25 30

Asp Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala
 35 40 45

Glu Ala Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln
 50 55 60

Lys Glu Glu Asp Arg Arg
 65 70

<210> 209

<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 209
Lys Thr Lys Lys Glu Val Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp
1 5 10 15
Thr Leu Lys Leu Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser
20 25 30
Asp Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala
35 40 45
Glu Ala Gln Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Lys Asp Gln
50 55 60
Lys Glu Glu Asp His Arg
65 70

<210> 210
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 210
Glu Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp
1 5 10 15
Thr Leu Lys Leu Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser
20 25 30
Asp Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Lys Lys Val Ala
35 40 45
Glu Ala Glu Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln
50 55 60
Lys Glu Glu Asp Arg Arg
65 70

<210> 211
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 211

Glu Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp
1 5 10 15

Ser Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser
20 25 30

Asp Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala
35 40 45

Glu Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln
50 55 60

Lys Glu Glu Asp Arg Arg
65 70

<210> 212

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 212

Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu
1 5 10 15

Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys
20 25 30

Ala Lys Glu Ser Gln Asp Glu Glu Lys Ile Lys Gln Ala Glu Ala Glu
35 40 45

Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr
50 55 60

Asp Arg Glu Gln Ala Glu
65 70

<210> 213

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 213

Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu
1 5 10 15

Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys
 20 25 30
 Ala Lys Glu Ser Gln Asp Glu Glu Lys Ile Lys Gln Ala Glu Ala Glu
 35 40 45
 Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr
 50 55 60
 Asp Arg Glu Gln Ala Glu
 65 70

<210> 214
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 214
 Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu
 1 5 10 15
 Phe Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu
 20 25 30
 Ala Lys Pro Ser Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys
 35 40 45
 Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Glu Ile Lys Thr
 50 55 60
 Glu Arg Lys Gln Ala Glu
 65 70

<210> 215
 <211> 70
 <212> PRT
 <213> Streptocarpus holstii

<400> 215
 Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu
 1 5 10 15
 Phe Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu
 20 25 30
 Ala Lys Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys

35 40 45
Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr
50 55 60

Asp Arg Lys Gln Ala Glu
65 70

<210> 216
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 216
Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu
1 5 10 15

Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Leu Lys Glu Glu
20 25 30

Ala Lys Glu Thr Arg Asn Glu Asp Thr Ile Asn Gln Ala Lys Ala Lys
35 40 45

Val Lys Ser Glu Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr
50 55 60

Asp Arg Glu Gln Ala Glu
65 70

<210> 217
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 217
Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu
1 5 10 15

Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu
20 25 30

Ala Lys Gly Ser Arg Asn Glu Gln Lys Val Asn Gln Ala Lys Ala Lys
35 40 45

Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr
50 55 60

Asp Arg Glu Gln Ala Glu
65 70

<210> 218
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 218
Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu
1 5 10 15

Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys
20 25 30

Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys Gln Ala Glu Ala Glu
35 40 45

Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr
50 55 60

Asp Arg Glu Gln Ala Glu
65 70

<210> 219
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 219
Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Glu Lys Ala Glu Glu
1 5 10 15

Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys Lys Ala Glu Ala Val Glu
20 25 30

Lys Asn Val Ala Thr Ser Glu Gln Asp Lys Pro Lys Arg Arg Ala Lys
35 40 45

Arg Gly Val Ser Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp
50 55 60

Ala Lys Ser Ser Asp Ser
65 70

<210> 220
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 220
Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Glu Lys Ala Glu Glu
1 5 10 15
Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys Lys Ala Glu Ala Val Glu
20 25 30
Lys Asn Val Ala Thr Ser Glu Gln Asp Lys Pro Lys Arg Arg Ala Lys
35 40 45
Arg Gly Val Ser Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp
50 55 60
Ala Lys Ser Ser Asp Ser
65 70

<210> 221
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 221
Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Ala Glu Glu Glu
1 5 10 15
Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys Lys Ala Ala Glu Ala Lys
20 25 30
Gln Lys Val Asp Thr Lys Glu Gln Gly Lys Pro Lys Arg Arg Ala Lys
35 40 45
Arg Gly Val Ser Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp
50 55 60
Ala Lys Ser Ser Asp Ser
65 70

<210> 222
<211> 70
<212> PRT

<213> Streptococcus pneumoniae

<400> 222

Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Ala Glu Glu Glu
1 5 10 15

Ala Lys Arg Lys Ala Asp Gly Lys Leu Lys Lys Ala Ala Glu Ala Glu
20 25 30

Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala Lys
35 40 45

Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp
50 55 60

Ala Lys Ser Ser Asp Ser
65 70

<210> 223

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 223

Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Glu Lys Ala Glu Glu
1 5 10 15

Ala Lys Arg Lys Ala Glu Ala Glu Glu Val Lys Ala Ala Glu Ala Glu
20 25 30

Ala Asn Val Ala Thr Ser Asp Lys Asp Lys Leu Lys Arg Arg Thr Lys
35 40 45

Arg Ala Val Pro Gly Glu Pro Ala Thr Pro Asp Lys Lys Glu Asn Asp
50 55 60

Ala Lys Ser Ser Asp Ser
65 70

<210> 224

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 224

Thr Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Glu Lys Ala Glu Glu

1 5 10 15
 Ala Lys Arg Lys Ala Asp Ala Lys Glu Val Lys Ala Ala Glu Ala Glu
 20 25 30
 Ala Asn Val Ala Thr Ser Asp Gln Asp Glu Ser Lys Arg Arg Val Lys
 35 40 45
 Gly Gly Val Pro Gly Glu Gln Ala Thr Leu Asp Lys Lys Glu Asn Asp
 50 55 60
 Ala Lys Ser Ser Asp Ser
 65 70

<210> 225
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 225
 Thr Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Glu Ala Glu Glu Glu
 1 5 10 15
 Ala Lys Arg Arg Ala Asp Ala Lys Glu Val Lys Ala Ala Glu Ala Glu
 20 25 30
 Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala Lys
 35 40 45
 Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp
 50 55 60
 Ala Lys Ser Ser Asp Ser
 65 70

<210> 226
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 226
 Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Asn Met Ala Asn
 1 5 10 15
 Glu Ser Gln Thr Glu His Arg Lys Asp Val Asp Glu Tyr Ile Lys Lys
 20 25 30

Met Leu Ser Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val
 35 40 45

Asn Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu
 50 55 60

Leu Ser Val Leu Lys Glu
 65 70

<210> 227
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 227
 Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Asn Met Ala Asn
 1 5 10 15

Glu Ser Gln Thr Glu His Arg Lys Asp Val Asp Glu Tyr Ile Lys Lys
 20 25 30

Met Leu Ser Glu Ile Gln Leu Asp Gly Arg Lys His Thr Pro Asn Val
 35 40 45

Asn Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu
 50 55 60

Leu Ser Val Leu Lys Glu
 65 70

<210> 228
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 228
 Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Asn Met Ala Asn
 1 5 10 15

Glu Ser Gln Thr Glu His Arg Lys Asp Val Asp Glu Tyr Ile Lys Lys
 20 25 30

Met Leu Ser Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val
 35 40 45

Asn Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu
50 55 60

Leu Ser Val Leu Lys Glu
65 70

<210> 229

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 229

Ser Val Gly Glu Glu Thr Leu Pro Ser Ser Ser Leu Asn Met Ala Asn
1 5 10 15

Glu Ser Gln Thr Glu His Arg Lys Asp Val Asp Glu Tyr Ile Lys Lys
20 25 30

Met Leu Ser Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val
35 40 45

Asn Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu
50 55 60

Leu Ser Val Leu Lys Glu
65 70

<210> 230

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 230

Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Ser Leu Asn Met Ala Asn
1 5 10 15

Glu Ser Gln Thr Glu His Arg Lys Asp Val Asp Glu Tyr Ile Lys Lys
20 25 30

Met Leu Ser Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val
35 40 45

Asn Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu
50 55 60

Leu Ser Val Leu Lys Glu

65

70

<210> 231

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 231

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Gly | Glu | Glu | Thr | Leu | Pro | Ser | Pro | Ser | Ser | Leu | Asn | Met | Ala | Asn |
| 1 | | | | 5 | | | | 10 | | | | 15 | | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glu | Ser | Gln | Thr | Glu | His | Arg | Lys | Asp | Val | Asp | Glu | Tyr | Ile | Lys | Lys |
| | | | 20 | | | | | 25 | | | | | 30 | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Leu | Ser | Glu | Ile | Gln | Leu | Asp | Arg | Arg | Lys | His | Thr | Gln | Asn | Val |
| | | 35 | | | | | 40 | | | | | 45 | | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asn | Leu | Asn | Ile | Lys | Leu | Ser | Ala | Ile | Lys | Thr | Lys | Tyr | Leu | Tyr | Glu |
| | 50 | | | | | 55 | | | | | 60 | | | | |

| | | | | | |
|-----|-----|-----|-----|-----|-----|
| Leu | Ser | Val | Leu | Lys | Glu |
| 65 | | | | 70 | |

<210> 232

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 232

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Gly | Glu | Glu | Thr | Leu | Pro | Ser | Pro | Ser | Ser | Leu | Asn | Met | Ala | Asn |
| 1 | | | | 5 | | | | 10 | | | | 15 | | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glu | Ser | Gln | Thr | Glu | His | Arg | Lys | Asp | Val | Asp | Glu | Tyr | Ile | Lys | Lys |
| | | | 20 | | | | | 25 | | | | | 30 | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Leu | Ser | Glu | Ile | Gln | Leu | Asp | Arg | Arg | Lys | His | Thr | Gln | Asn | Val |
| | | 35 | | | | | 40 | | | | | 45 | | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asn | Leu | Asn | Ile | Lys | Leu | Ser | Ala | Ile | Lys | Thr | Lys | Tyr | Leu | Tyr | Glu |
| | 50 | | | | | 55 | | | | | 60 | | | | |

| | | | | | |
|-----|-----|-----|-----|-----|-----|
| Leu | Ser | Val | Leu | Lys | Glu |
| 65 | | | | 70 | |

<210> 233

<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 233

```
Asn Ser Lys Lys Glu Glu Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr
  1              5              10              15

Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Lys Pro Glu Lys Lys
      20              25              30

Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Lys
      35              40              45

Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys
      50              55              60

Thr Leu Glu Leu Glu Ile
      65              70
```

<210> 234
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 234

```
Asn Ser Lys Lys Glu Glu Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr
  1              5              10              15

Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Lys Pro Glu Lys Lys
      20              25              30

Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Lys
      35              40              45

Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys
      50              55              60

Thr Leu Glu Leu Glu Ile
      65              70
```

<210> 235
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 235

Asn Ser Lys Lys Glu Glu Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr
1 5 10 15

Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Lys Pro Glu Lys Lys
20 25 30

Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Lys
35 40 45

Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys
50 55 60

Thr Leu Glu Leu Glu Ile
65 70

<210> 236

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 236

Asn Ser Lys Lys Glu Glu Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr
1 5 10 15

Ala Ala Phe Glu Gln Phe Lys Lys Asp Ser Leu Lys Ser Gly Lys Lys
20 25 30

Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys
35 40 45

Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys
50 55 60

Thr Leu Asp Leu Glu Ile
65 70

<210> 237

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 237

Asn Ser Lys Lys Glu Glu Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr
1 5 10 15

Ala Ala Phe Glu Gln Phe Lys Lys Asp Ser Leu Lys Ser Gly Lys Lys
 20 25 30

Val Ala Glu Ala Gln Lys Lys Val Ala Glu Ala Glu Lys Lys Ala Lys
 35 40 45

Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys
 50 55 60

Thr Leu Asp Leu Glu Ile
 65 70

<210> 238

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 238

Asn Ser Lys Lys Glu Glu Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr
 1 5 10 15

Ala Ala Phe Glu Gln Phe Lys Lys Asp Ser Leu Lys Ser Gly Lys Lys
 20 25 30

Val Ala Glu Ala Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Ala Lys
 35 40 45

Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys
 50 55 60

Thr Leu Glu Leu Glu Ile
 65 70

<210> 239

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 239

Asn Ser Lys Lys Glu Glu Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr
 1 5 10 15

Ala Ala Phe Glu Gln Phe Lys Lys Asp Ser Leu Lys Pro Glu Lys Lys
 20 25 30

Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu

35 40 45
 Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys
 50 55 60

Thr Leu Glu Leu Glu Ile
 65 70

<210> 240
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 240
 Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys
 1 5 10 15

Glu Glu Ala Asn Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys
 20 25 30

Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile
 35 40 45

Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu
 50 55 60

Glu Ser Glu Lys Lys Ala
 65 70

<210> 241
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 241
 Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys
 1 5 10 15

Glu Glu Ala Asn Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys
 20 25 30

Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile
 35 40 45

Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu
 50 55 60

Glu Ser Glu Lys Lys Ala
65 70

<210> 242

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 242

Ala Glu Ser Asp Val Lys Val Lys Lys Ala Glu Leu Glu Leu Val Lys
1 5 10 15

Glu Glu Ala Asn Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys
20 25 30

Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile
35 40 45

Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu
50 55 60

Glu Ser Glu Lys Lys Ala
65 70

<210> 243

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 243

Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys
1 5 10 15

Glu Glu Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys
20 25 30

Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile
35 40 45

Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala
50 55 60

Glu Glu Asp Lys Lys Ala
65 70

<210> 244
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 244
Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys
1 5 10 15
Glu Glu Ala Lys Glu Ser Arg Asn Glu Glu Lys Val Lys Gln Ala Lys
20 25 30
Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile
35 40 45
Lys Thr Asp Arg Lys Lys Ala Ala Glu Glu Ala Lys Arg Arg Ala Ala
50 55 60
Glu Glu Asp Lys Lys Ala
65 70

<210> 245
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 245
Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys
1 5 10 15
Glu Glu Ala Lys Glu Ser Arg Asn Glu Glu Lys Val Lys Gln Ala Lys
20 25 30
Ala Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile
35 40 45
Lys Thr Asp Arg Lys Lys Ala Ala Glu Glu Ala Lys Arg Lys Ala Ala
50 55 60
Glu Glu Asp Lys Lys Ala
65 70

<210> 246
<211> 70
<212> PRT

<213> Streptococcus pneumoniae

<400> 246

Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys
1 5 10 15

Glu Glu Ala Lys Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys
20 25 30

Ala Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile
35 40 45

Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala
50 55 60

Glu Glu Asp Lys Lys Ala
65 70

<210> 247

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 247

Ala Glu Ala Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala
1 5 10 15

Lys Ile Ala Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu
20 25 30

Lys Glu Ile Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu
35 40 45

Arg Ala Pro Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser
50 55 60

Lys Leu Glu Glu Leu Ser
65 70

<210> 248

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 248

Ala Glu Ala Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala

| | | | |
|---|----|----|----|
| 1 | 5 | 10 | 15 |
| Lys Ile Ala Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu | | | |
| 20 | 25 | 30 | |
| Lys Glu Ile Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu | | | |
| 35 | 40 | 45 | |
| Arg Ala Pro Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser | | | |
| 50 | 55 | 60 | |
| Lys Leu Glu Glu Leu Ser | | | |
| 65 | 70 | | |

<210> 249
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

| |
|---|
| <400> 249 |
| Ala Glu Ala Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala |
| 1 5 10 15 |
| Lys Ile Ala Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu |
| 20 25 30 |
| Lys Glu Ile Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu |
| 35 40 45 |
| Arg Ala Pro Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser |
| 50 55 60 |
| Lys Leu Glu Glu Leu Ser |
| 65 70 |

<210> 250
 <211> 70
 <212> PRT
 <213> Streptococcus pneumoniae

| |
|---|
| <400> 250 |
| Ala Glu Ala Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala |
| 1 5 10 15 |
| Lys Ile Ala Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu |
| 20 25 30 |

Lys Glu Ile Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu
35 40 45

Arg Ala Pro Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser
50 55 60

Lys Leu Glu Glu Leu Ser
65 70

<210> 251

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 251

Ala Glu Ala Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala
1 5 10 15

Lys Ile Ala Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu
20 25 30

Lys Glu Ile Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu
35 40 45

Arg Ala Pro Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser
50 55 60

Lys Leu Glu Glu Leu Ser
65 70

<210> 252

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 252

Ala Glu Ala Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala
1 5 10 15

Lys Ile Ala Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu
20 25 30

Lys Glu Ile Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu
35 40 45

Arg Ala Pro Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser
50 55 60

Lys Leu Glu Glu Leu Ser
65 70

<210> 253

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 253

Ala Glu Ala Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala
1 5 10 15

Lys Ile Ala Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu
20 25 30

Lys Glu Ile Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu
35 40 45

Arg Ala Pro Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser
50 55 60

Lys Leu Glu Glu Leu Ser
65 70

<210> 254

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 254

Asp Lys Ile Asp Glu Leu Asp Ala Glu Ile Ala Lys Leu Glu Val Gln
1 5 10 15

Leu Lys Asp Ala Glu Gly Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu
20 25 30

Gly Leu Glu Lys Thr Thr Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala
35 40 45

Glu Ala Asp Leu Lys Lys Ala Val Asp Glu Pro Glu Thr Pro Ala Pro
50 55 60

Ala Pro Gln Pro Ala Pro

65

70

<210> 255

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 255

Asp Lys Ile Asp Glu Leu Asp Ala Glu Ile Ala Lys Leu Glu Val Gln
1 5 10 15

Leu Lys Asp Ala Glu Gly Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu
20 25 30

Gly Leu Glu Lys Thr Thr Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala
35 40 45

Glu Ala Asp Leu Lys Lys Ala Val Asp Glu Pro Glu Thr Pro Ala Pro
50 55 60

Ala Pro Gln Pro Ala Pro
65 70

<210> 256

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 256

Asp Lys Ile Asp Glu Leu Asp Ala Glu Ile Ala Lys Leu Glu Val Gln
1 5 10 15

Leu Lys Asp Ala Glu Gly Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu
20 25 30

Gly Leu Glu Lys Thr Thr Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala
35 40 45

Glu Ala Asp Leu Lys Lys Ala Val Asp Glu Pro Glu Thr Pro Ala Pro
50 55 60

Ala Pro Gln Pro Ala Pro
65 70

<210> 257

<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 257

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asp | Lys | Ile | Asp | Glu | Leu | Asp | Ala | Glu | Ile | Ala | Lys | Leu | Glu | Val | Lys |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |
| Glu | Lys | Pro | Ala | Glu | Gly | Asn | Asn | Asn | Val | Glu | Ala | Tyr | Phe | Lys | Glu |
| | | | 20 | | | | | 25 | | | | | 30 | | |
| Gly | Leu | Glu | Lys | Thr | Thr | Ala | Glu | Lys | Lys | Ala | Glu | Leu | Glu | Lys | Ala |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| Glu | Ala | Asp | Leu | Lys | Lys | Ala | Val | Asp | Glu | Pro | Glu | Thr | Pro | Gln | Pro |
| | 50 | | | | | 55 | | | | | 60 | | | | |
| Gln | Pro | Ala | Pro | Ala | Thr | | | | | | | | | | |
| 65 | | | | | 70 | | | | | | | | | | |

<210> 258
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 258

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asp | Lys | Ile | Asp | Glu | Leu | Asp | Ala | Glu | Ile | Ala | Lys | Leu | Glu | Val | Lys |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |
| Glu | Lys | Pro | Ala | Glu | Gly | Asn | Asn | Asn | Val | Glu | Ala | Tyr | Phe | Lys | Glu |
| | | | 20 | | | | | 25 | | | | | 30 | | |
| Gly | Leu | Glu | Lys | Thr | Thr | Ala | Glu | Lys | Lys | Ala | Glu | Leu | Glu | Lys | Ala |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| Glu | Ala | Asp | Leu | Lys | Lys | Ala | Val | Asp | Glu | Pro | Glu | Thr | Pro | Gln | Pro |
| | 50 | | | | | 55 | | | | | 60 | | | | |
| Gln | Pro | Ala | Pro | Ala | Pro | | | | | | | | | | |
| 65 | | | | | 70 | | | | | | | | | | |

<210> 259
<211> 70
<212> PRT
<213> Streptococcus pneumoniae

<400> 259

Asp Lys Ile Asp Glu Leu Asp Ala Glu Ile Ala Lys Leu Glu Val Lys
1 5 10 15

Glu Lys Pro Ala Glu Gly Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu
20 25 30

Gly Leu Glu Lys Thr Thr Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala
35 40 45

Glu Ala Asp Leu Lys Lys Ala Val Asp Glu Pro Glu Thr Pro Gln Pro
50 55 60

Gln Pro Ala Pro Ala Pro
65 70

<210> 260

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 260

Asp Lys Ile Asp Glu Leu Asp Ala Glu Ile Ala Lys Leu Glu Val Lys
1 5 10 15

Glu Lys Pro Ala Glu Gly Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu
20 25 30

Gly Leu Glu Lys Thr Thr Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala
35 40 45

Glu Ala Asp Leu Lys Lys Ala Val Asp Glu Pro Glu Thr Pro Gln Pro
50 55 60

Gln Pro Ala Pro Ala Pro
65 70

<210> 261

<211> 69

<212> PRT

<213> Streptococcus pneumoniae

<400> 261

Ala Pro Glu Lys Pro Thr Glu Glu Ala Glu Lys Pro Ala Pro Ala Pro
1 5 10 15

Lys Pro Glu Lys Pro Ala Pro Ala Pro Lys Ala Glu Lys Pro Ala Pro
20 25 30

Ala Pro Ala Glu Lys Pro Ala Glu Glu Pro Ala Glu Lys Pro Ala Pro
35 40 45

Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Thr Pro
50 55 60

Glu Thr Pro Lys Thr
65

<210> 262

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 262

Ala Pro Glu Lys Pro Thr Glu Glu Ala Glu Lys Pro Ala Pro Ala Pro
1 5 10 15

Ala Pro Glu Lys Pro Ala Pro Ala Pro Lys Ala Glu Lys Pro Ala Pro
20 25 30

Ala Pro Ala Glu Lys Pro Ala Glu Glu Pro Ala Glu Lys Pro Ala Pro
35 40 45

Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro
50 55 60

Glu Lys Pro Ala Pro Ala
65 70

<210> 263

<211> 69

<212> PRT

<213> Streptococcus pneumoniae

<400> 263

Ala Pro Glu Lys Pro Thr Glu Glu Ala Glu Lys Pro Ala Pro Ala Pro
1 5 10 15

Ala Pro Glu Lys Pro Ala Pro Ala Pro Lys Ala Glu Lys Pro Ala Glu
20 25 30

Lys Pro Ala Glu Lys Pro Ala Glu Glu Pro Ala Glu Lys Pro Ala Pro

35 40 45
 Ala Pro Glu Lys Pro Ala Pro Thr Pro Glu Lys Pro Ala Pro Thr Pro
 50 55 60

Glu Thr Pro Lys Thr
 65

<210> 264
 <211> 69
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 264
 Gln Pro Glu Lys Pro Thr Glu Glu Ala Glu Lys Pro Ala Pro Ala Pro
 1 5 10 15

Lys Pro Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp
 20 25 30

Gln Gln Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn
 35 40 45

Arg Leu Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro
 50 55 60

Ser Thr Pro Lys Thr
 65

<210> 265
 <211> 69
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 265
 Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro
 1 5 10 15

Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp
 20 25 30

Gln Gln Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn
 35 40 45

Arg Leu Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro
 50 55 60

Ser Thr Pro Lys Thr
65

<210> 266
<211> 66
<212> PRT
<213> Streptococcus pneumoniae

<400> 266
Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro
1 5 10 15
Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp
20 25 30
Gln Gln Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn
35 40 45
Arg Leu Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro
50 55 60

Ser Thr
65

<210> 267
<211> 69
<212> PRT
<213> Streptococcus pneumoniae

<400> 267
Lys Ala Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro
1 5 10 15
Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp
20 25 30
Gln Gln Ala Glu Glu Glu Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn
35 40 45
Arg Leu Thr Leu Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro
50 55 60

Ser Thr Pro Lys Thr
65

<210> 268

<211> 15

<212> PRT

<213> Streptococcus pneumoniae

<400> 268

Pro Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Thr Pro Glu Thr
1 5 10 15

<210> 269

<211> 730

<212> PRT

<213> Streptococcus pneumoniae

<400> 269

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Val Val Ala Ser Leu Phe Leu Gly
20 25 30

Gly Val Val His Ala Glu Glu Val Arg Arg Gly Asn Asn Leu Thr Val
35 40 45

Thr Ser Ser Gly Asp Glu Val Glu Ser His Tyr Gln Ser Ile Leu Glu
50 55 60

Lys Val Arg Lys Ser Leu Glu Lys Asp Arg His Thr Gln Asn Val Asp
65 70 75 80

Leu Ile Lys Lys Leu Gln Asp Ile Lys Arg Thr Tyr Leu Tyr Asn Leu
85 90 95

Lys Glu Lys Pro Glu Ala Glu Leu Thr Ser Lys Thr Asn Lys Glu Leu
100 105 110

Asp Ala Ala Phe Glu Lys Phe Lys Lys Glu Pro Glu Leu Thr Lys Lys
115 120 125

Leu Ala Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp His
130 135 140

Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Ile Glu Leu Glu Ile Ala
145 150 155 160

Glu Ala Glu Val Gly Val Ala Lys Ala Glu Leu Glu Leu Ala Gln Ala

| | | |
|---|-----|-----|
| 165 | 170 | 175 |
| Gln Val Gln Ile Pro Gln Asp Thr Glu Lys Ile Asn Ala Ala Lys Ala | | |
| 180 | 185 | 190 |
| Lys Val Glu Ala Ala Lys Ser Asn Val Lys Lys Leu Glu Lys Ile Lys | | |
| 195 | 200 | 205 |
| Ser Asp Ile Glu Lys Thr Tyr Leu Tyr Lys Leu Asp Asn Ser Thr Lys | | |
| 210 | 215 | 220 |
| Glu Thr Pro Lys Ser Arg Val Arg Arg Asn Ser Pro Gln Val Gly Asp | | |
| 225 | 230 | 235 |
| Ser Arg Glu Leu Lys Glu Thr Ile Asp Lys Ala Lys Glu Thr Leu Ser | | |
| 245 | 250 | 255 |
| Thr Tyr Met Val Thr Arg Leu Thr Lys Leu Asp Pro Ser Val Phe Trp | | |
| 260 | 265 | 270 |
| Phe Ala Asp Leu Leu Met Asp Ala Lys Lys Val Val Glu Glu Tyr Lys | | |
| 275 | 280 | 285 |
| Thr Lys Leu Glu Asp Ala Ser Asp Lys Lys Ser Val Glu Asp Leu Arg | | |
| 290 | 295 | 300 |
| Lys Glu Ala Glu Gly Lys Ile Glu Ser Leu Ile Val Thr His Gln Asn | | |
| 305 | 310 | 315 |
| Arg Glu Lys Glu Asn Gln Pro Ala Pro Gln Pro Gly Gly Gln Ala Gly | | |
| 325 | 330 | 335 |
| Gly Ser Met Val Val Pro Pro Val Thr Gln Thr Pro Pro Ser Thr Ser | | |
| 340 | 345 | 350 |
| Gln Ser Pro Gly Gln Lys Ala Thr Glu Ala Glu Lys Lys Lys Leu Gln | | |
| 355 | 360 | 365 |
| Asp Leu Ile Arg Gln Phe Gln Glu Ala Leu Asn Lys Leu Asp Asp Glu | | |
| 370 | 375 | 380 |
| Thr Lys Thr Val Pro Asp Gly Ala Lys Leu Thr Gly Glu Ala Gly Lys | | |
| 385 | 390 | 395 |
| Ala Tyr Asn Glu Thr Arg Thr Tyr Ala Lys Glu Val Val Asp Lys Ser | | |
| 405 | 410 | 415 |
| Lys Lys Leu Leu Ser Gln Thr Ala Val Thr Met Asp Glu Leu Ala Met | | |

| | | |
|---|-----|---------|
| 420 | 425 | 430 |
| Gln Leu Thr Lys Leu Asn Asp Ala Met Ser Lys Leu Lys Glu Ala Lys | | |
| 435 | 440 | 445 |
| Ala Lys Leu Val Pro Glu Val Lys Pro Gln Pro Glu Asn Pro Glu Pro | | |
| 450 | 455 | 460 |
| Lys Pro Gln Pro Glu Gly Glu Lys Pro Ser Val Pro Asp Ile Asn Gln | | |
| 465 | 470 | 475 480 |
| Glu Lys Glu Lys Ala Lys Leu Ala Ile Ala Thr Tyr Met Ser Lys Ile | | |
| 485 | 490 | 495 |
| Leu Asp Asp Ile Lys Lys His His Leu Lys Lys Glu Lys His His Gln | | |
| 500 | 505 | 510 |
| Ile Val Ala Leu Ile Lys Asp Leu Asp Lys Leu Arg Lys Gln Ala Leu | | |
| 515 | 520 | 525 |
| Ser Glu Ile Asp Asn Val Asn Thr Lys Val Glu Ile Glu Asn Thr Val | | |
| 530 | 535 | 540 |
| His Lys Val Phe Ala Asp Met Asp Thr Val Val Thr Lys Phe Gln Lys | | |
| 545 | 550 | 555 560 |
| Gly Leu Ile Gln Asn Thr Pro Gln Val Pro Glu Ala Gln Arg Ala Gln | | |
| 565 | 570 | 575 |
| Arg Tyr Gln Arg Phe Gln Ile His Gln Lys Ala Pro Asp Thr Pro Gln | | |
| 580 | 585 | 590 |
| Val Pro Glu Ala Pro Lys Ser Pro Glu Val Pro Lys Val Pro Glu Ala | | |
| 595 | 600 | 605 |
| Pro Lys Ala Pro Asp Thr Pro Gln Val Pro Glu Ala Pro Lys Ser Pro | | |
| 610 | 615 | 620 |
| Glu Val Pro Lys Val Ser Asp Thr Pro Lys Ala Pro Asp Thr Pro Gln | | |
| 625 | 630 | 635 640 |
| Val Pro Glu Ala Pro Lys Ser Pro Glu Val Pro Lys Val Pro Glu Ala | | |
| 645 | 650 | 655 |
| Pro Lys Ala Pro Asp Thr Pro Gln Val Pro Glu Ala Pro Lys Ser Pro | | |
| 660 | 665 | 670 |
| Glu Val Pro Lys Val Pro Asp Thr Pro Lys Ala Pro Asp Thr Pro Gln | | |

675

680

685

Val Pro Glu Ala Pro Lys Ala Pro Asp Thr Pro Gln Ile Pro Glu Ala
 690 695 700

Pro Ala Pro Glu Thr Pro Ala Pro Ala Pro Glu Ala Pro Lys Thr Gly
 705 710 715 720

Trp Lys Gln Glu Asn Gly Met Trp Lys Gly
 725 730

<210> 270

<211> 2349

<212> DNA

<213> Streptococcus pneumoniae

<400> 270

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 atagtaaggc taaagaaaaa atatagaagg aaataaacat gtttgcataca aaaagcgaaa 180
 gaaaagtaca ttattcaatt cgtaaattta gtattggagt agctagtgtg gtagttgcta 240
 gtttgttctt aggaggagta gttcacgcag aagagggttag aagaggggaat aacctcacgg 300
 ttacatctag tggggatgaa gtcgagtcgc attatcaaag tatattggag aaggtcagaa 360
 aaagtttgga aaaagatcga catacccaa atgtcgactt aatcaaaaag ttgcaagaca 420
 ttaagagaac gtatttgtat aattttaaag agaagccgga agctgagttg acgtcaaaaa 480
 caaataaaga gttagacgca gcttttgaga agtttataaa agaaccagaa cttactaaaa 540
 aattagcaga agctgagaaa aaagccaagg atcaaaaaga agaagatcac cgtaactacc 600
 caaccaatac ttacaaaaca atcgaactgg aaattgcgga agcagaagta ggggtcgcca 660
 aggcagagct tgagcttgca caagctcaag tccaaatacc tcaagatact gagaaaatta 720
 atgctgctaa agctaaagta gaagctgcta aaagtaatgt taaaaaacta gaaaaaatta 780
 aatcagatat tgaaaaaacg tatttgtata aattagataa ctcaaccaa gaaacgcca 840
 aatctagagt gcgaagaaat tctccgcaag taggcgattc gagagaactt aaggaaacga 900
 tagacaaagc gaaagaaact ctgtctacct atatggtaac tcgtttaacg aagctggatc 960
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 agacaaaatt agaggatgct tcagataaaa aatcggtaga agacttgca aaggaagcag 1080
 aaggaaaaat agagtctctt atcgtgactc accaaaatag agaaaaagaa aaccaaccag 1140
 caccccaacc aggaggacaa gcagggtggt caatggttgt accaccggtg acgcaaacac 1200
 ctccatcaac ttcccaaagt ccaggacaaa aggcgaccga agctgaaaag aaaaagttac 1260
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 ttccagatgg ggctaaactc acaggagaag ctggaaaagc ctataatgag actagaactt 1380
 atgcgaaaga agttgttgac aagagcaaga agcttctatc acagacagca gtgacaatgg 1440
 atgaattggc aatgcaatta accaaattga acgatgccat gtctaaattg aaagaagcta 1500
 aagcgaaatt ggtaccagag gttaaaccac agccggaaaa ccagagcca aaaccacaac 1560
 cagaggggtga gaaaccaagc gtaccagata ttaatcagga gaaagaaaaa gctaaacttg 1620
 ctatagcaac atacatgagc aagatttttag atgatataaa gaaacatcat ctgaagaaag 1680
 aaaaacatca tcagattgtt gctcttatta aggaccttga taaacttaga aagcaagcac 1740
 tttctgaaat tgataatgta aataccaaag tagaaattga gaatacagtc cacaaggat 1800

| | | | | | | |
|------------|------------|------------|-------------|------------|------------|------|
| ttgcagacat | ggatacgggt | gttactaaat | tccaaaaagg | cttaattcag | aacacaccgc | 1860 |
| aggttccaga | agcccaaaga | gcccagaggt | accaaagggt | tcagatacac | caaaaggctc | 1920 |
| cggacacacc | gcaggttcca | gaagcaccaa | agagcccaga | ggtaccaaag | gttccagaag | 1980 |
| caccaaaggc | tccggacaca | ccgcaagttc | cggaaagcacc | aaagagccca | gaggtacca | 2040 |
| aggtttcaga | tacaccaaag | gctccggaca | caccgcaggt | tccagaagca | caaagagcc | 2100 |
| cagaggtacc | aaagggtcca | gaagcaccaa | aggctccgga | cacaccgcaa | gttccggaag | 2160 |
| caccaaagag | cccagaggta | ccaaaggttc | cagatacacc | aaagggtccg | gacacaccgc | 2220 |
| aggttccaga | agcaccaaag | gctccagaca | caccgcaaat | tccggaagca | ccagctccag | 2280 |
| aaactccggc | tccagctcca | gaagctccaa | aaacaggctg | gaaacaagaa | aacggtatgt | 2340 |
| ggaagggcg | | | | | | 2349 |

<210> 271

<211> 2405

<212> DNA

<213> Streptococcus pneumoniae

<400> 271

| | | | | | | |
|------------|-------------|------------|------------|------------|------------|------|
| cggccgccag | tgtgatggat | atctgcagaa | ttcgcccttc | gacgaatagc | tgaagaggaa | 60 |
| aagctattac | atgaagttat | aatcccaa | ggaagcataa | agagataaat | acaaaattcg | 120 |
| atztatatac | agttcatatt | gaagtgat | agtaaggtta | aagaaaaaat | atagaaggaa | 180 |
| ataaacatgt | ttgcatcaaa | aagcgaaaga | aaagtacatt | attcaattcg | taaatttagt | 240 |
| attggagtag | ctagtgtagt | agttgctagt | cttgttatgg | gaagtgtggt | tcatgcgacg | 300 |
| gagaatgagg | gaattaccca | agtagccact | tcttataata | aggcaaatga | aagtcagaca | 360 |
| gaacatagga | aagctgctaa | acaagtcgat | gaagatataa | aaaaaatggt | gagtggagtc | 420 |
| caagaatata | taaaaaaaat | gttgagtgg | atccaattag | ataaaagaaa | acatacccaa | 480 |
| aatgtcaact | taaacagaaa | gttgagcgca | attcaaacga | agtatttgta | tgaattaaga | 540 |
| gtttttaaag | agaagtcgaa | aaaagaagag | ttgacgtcaa | aaacaaaaaa | agagttagac | 600 |
| gcagcttttg | agaagtttaa | aaaagaacca | gaacttacta | aaaaattagc | agaagctaaa | 660 |
| caaaaagcca | aggctcaaaa | agaagaagat | ttccgtaact | acccaaccaa | tacttacaaa | 720 |
| acgcttgaac | ttgaaattgc | tgagttcgat | gtgaaagtta | aagaagcggg | gcttgaacta | 780 |
| gtaaaagagg | aagctaaacc | ccgaaacgag | gaaaaaatta | agcaagcaaa | agcgaaagtt | 840 |
| gagagtaaaa | aagctgaggc | tacaaggtta | gaagaaatca | agacagaacg | taaaaaagca | 900 |
| gaagaagaag | ctaaacgaaa | agcagaagaa | tctgagaaaa | aagctgctga | agccaaacaa | 960 |
| aaagtggata | ctaaagagca | aggtaaacca | aagaggcggg | caaaacgagg | agtttctgga | 1020 |
| gagctagcaa | cacctgataa | aaaagaaaat | gatgcgaagt | cttcagattc | tagcgtaggt | 1080 |
| gaagaaactc | ttccaagccc | atcccttaat | atggcaaatg | aaagtcagac | agaacatagg | 1140 |
| aaagatgtcg | atgaatatat | aaaaaaaatg | ttgagtggga | tccaattaga | tagaagaaaa | 1200 |
| catacccaaa | atgtcaactt | aaacataaag | ttgagcgcaa | ttaaaacgaa | gtatttgtat | 1260 |
| gaattaagtg | ttttaaaaga | gaactcgaaa | aaagaagagt | tgacgtcaaa | aaccaaagca | 1320 |
| gagttaaccg | cagcttttga | gcagttttaa | aaagatacat | tgaaaccaga | aaaaaaggta | 1380 |
| gcagaagctg | agaagaagggt | tgaagaagct | aagaaaaaag | ccaaggatca | aaaagaagaa | 1440 |
| gatcgccgta | actacccaac | caatacttac | aaaacgcttg | aacttgaaat | tgctgagtc | 1500 |
| gatgtgaaag | ttaaaaaagc | ggagcttgaa | ctagtaaaag | aggaagctaa | cgaatctcga | 1560 |
| aacgaggaaa | aaattaagca | agcaaaagag | aaagttgaga | gtaaaaaagc | tgaggctaca | 1620 |
| aggttagaaa | aatcaagac | agatcgtaaa | aaagcagaag | aagaagctaa | acgaaaagca | 1680 |
| gaagaatctg | agaaaaaagc | tgctgaagcc | aaacaaaaag | tggatgctga | agaatatgct | 1740 |
| cttgaagcta | aatcgctga | gttggaatat | gaagttcaga | gactagaaaa | agagctcaaa | 1800 |
| gagattgatg | agtctgactc | agaagattat | cttaaagaag | gcctccgtgc | tcctcttcaa | 1860 |

| | | | | | | |
|-------------|------------|------------|------------|------------|------------|------|
| tctaaattgg | ataccaaaaa | agctaaacta | tcaaaacttg | aagagttgag | tgataagatt | 1920 |
| gatgagttag | acgctgaaat | tgcaaaactt | gaagttcaac | ttaaagatgc | tgaaggaaac | 1980 |
| aataatgtag | aagcctactt | taaagaaggt | ttagagaaaa | ctactgctga | gaaaaaagct | 2040 |
| gaattagaaa | aagctgaagc | tgaccttaag | aaagcagttg | atgagccaga | aactccagct | 2100 |
| ccggctcctc | aaccagctcc | agctccagaa | aaaccagctg | aaaaaccagc | tccagctcca | 2160 |
| gctccagaaa | aaccagctcc | agctccagaa | aaaccagctg | aaaaaccagc | tgaaaaacca | 2220 |
| gctgaagaac | cagctgaaaa | accagctcca | gctccagaaa | aaccagctcc | aactccagaa | 2280 |
| aaaccagctc | caactccaga | aactccaaaa | acaggctgga | aacaagaaaa | cggtatgtgg | 2340 |
| tactttctaca | atactgatgg | ttcaatggca | acaggctggc | tccaaaacaa | tggttcattg | 2400 |
| tacta | | | | | | 2405 |

<210> 272

<211> 2774

<212> DNA

<213> Streptococcus pneumoniae

<400> 272

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| taatcacaaa | tatgtagatc | atatcttggt | taggacagta | aaacatccta | attacttttt | 120 |
| aaatattctt | cctgagttga | ttggcttgac | cttggttagt | catgcttatg | tgacttttgt | 180 |
| tttagttttt | ccagtttatg | cagttatttt | gtatcgacga | atagctgaag | aggaaaagct | 240 |
| attacatgaa | gttataatcc | caaagtgaag | cataaagaga | taaatacaaa | attcgattta | 300 |
| tatacagttc | atattgaagt | aatatagtaa | ggttaaagaa | aaaatataga | aggaaataaa | 360 |
| catgttttga | tcaaaaagcg | aaagaaaagt | acattattca | attcgtaaag | ttagtattgg | 420 |
| agtagctagt | gtagctggtg | ccagtcttgt | tatgggaagt | gtgggttcag | cgacagagaa | 480 |
| cgagggaagt | acccaagcag | ccacttcttc | taatattgga | aagacagaac | ataggaaagc | 540 |
| tgctaaacaa | gtcgtcgatg | aatatataga | aaaaatgttg | aggagatttc | aactagatag | 600 |
| aagaaaacat | acccaaaatg | tgcctttaa | cataaagttg | agcgcaatta | aaacgaagta | 660 |
| tttgctgaa | ttaaattgtt | tagaagagaa | gtcgaaagat | gagttgccgt | cagaaataaa | 720 |
| agcaaagtta | gacgcagctt | ttgagaagtt | taaaaaagat | acattgaaac | caggagaaaa | 780 |
| ggtagcagaa | gctaagaaga | aggttgaaga | agctaagaaa | aaagccgagg | atcaaaaaga | 840 |
| agaagatcgt | cgtaactacc | caaccaatac | ttacaaaacg | cttgaacttg | aaattgctga | 900 |
| gttcgatgtg | aaagttaaag | aagcggagct | tgaactagta | aaagaggaag | ctaaagaatc | 960 |
| tcgaaacgag | ggcacaatta | agcaagcaaa | agagaaagtt | gagagtaaaa | aagctgaggc | 1020 |
| tacaagggtta | gaaaacatca | agacagatcg | taaaaaagca | gaagaagaag | ctaaacgaaa | 1080 |
| agcagatggg | aagttgaagg | aagctaattg | agcgacttca | gatcaaggta | aaccaaaggg | 1140 |
| gcggggcaaaa | cgaggagtcc | ctggagagct | agcaacacct | gataaaaaag | aaaatgatgc | 1200 |
| gaagtcttca | gattctagcg | taggtgaaga | aactcttcca | agctcatccc | tgaaatcagg | 1260 |
| aaaaaaggta | gcagaagctg | agaagaaggt | tgaagaagct | gagaaaaaag | ccaaggatca | 1320 |
| aaaagaagaa | gatcgccgta | actaccaaac | caatacttac | aaaacgcttg | accttgaaat | 1380 |
| tgctgagtc | gatgtgaaa | ttaaagaagc | ggagcttgaa | ctagtataag | aggaagctaa | 1440 |
| ggaacctcga | gacgaggaaa | aaattaagca | agcaaaagcg | aaagttgaga | gtaaaaaagc | 1500 |
| tgaggctaca | aggttagaaa | acatcaagac | agatcgtaaa | aaagcagaag | agaagctaa | 1560 |
| acgaaaagca | gcagaagaag | ataaagttaa | agaaaaacca | gctgaacaac | cacaaccagc | 1620 |
| gccggctact | caaccagaaa | aaccagctcc | aaaaccagag | aagccagctg | aacaacaaaa | 1680 |
| agcagaaaaa | acagatgatc | aacaagctga | agaagactat | gctcgtagat | cagaagaaga | 1740 |
| atataatcgc | ttgactcaac | agcaaccgcc | aaaaactgaa | aaaccagcac | aaccatctac | 1800 |
| tccaaaaaca | ggctggaaac | aagaaaacgg | tatgtggtac | ttctacaata | ctgatgggtc | 1860 |

| | | | | | | |
|------------|-------------|------------|-------------|------------|-------------|------|
| aatggcaaca | ggatggctcc | aaaacaacgg | ttcatgggtac | tatctaaacg | ctaattggtgc | 1920 |
| tatggcgaca | ggatggctcc | aaaacaatgg | ttcatgggtac | tatctaaacg | ctaattggttc | 1980 |
| aatggcaaca | ggatggctcc | aaaacaatgg | ttcatgggtac | tacctaaacg | ctaattggtgc | 2040 |
| tatggcgaca | ggatggctcc | aatacaatgg | ttcatgggtac | tacctaaaca | gcaatggcgc | 2100 |
| tatggcgaca | ggatggctcc | aatacaatgg | ctcatgggtac | tacctcaacg | ctaattggtga | 2160 |
| tatggcgaca | ggatggctcc | aaaacaacgg | ttcatgggtac | tacctcaacg | ctaattggtga | 2220 |
| tatggcgaca | ggatggctcc | aatacaacgg | ttcatgggtat | tacctcaacg | ctaattggtga | 2280 |
| tatggcgaca | ggttgggtga | aagatggana | tacctgggtac | tatcttaaag | catcaggtgc | 2340 |
| tatgaaagca | agccaatggt | tcaaagtatc | agataaatgg | tactatgtca | atggctcagg | 2400 |
| tgcccttgca | gtcaacacaa | ctgtagatgg | ctatggagtc | aatgccaatg | gtgaatgggt | 2460 |
| aaactaaacc | taatataact | agttaatact | gacttcctgt | aagaactttt | taaagtattc | 2520 |
| cctacaaata | ccatatacctt | tcagtagata | atataccctt | gtaggaagtt | tagattaaaa | 2580 |
| aataactctg | taatctctag | ccggatttat | agcgctagag | actacggagt | ttttttgatg | 2640 |
| aggaaagaat | ggcggcattc | aagagactct | ttaagagagt | tacgggtttt | aaactattaa | 2700 |
| gccttctcca | attgcaagag | ggcttcaatc | tctgctaggg | tgctagcttg | cgaaatggct | 2760 |
| ccacggagtt | tngc | | | | | 2774 |

<210> 273

<211> 2489

<212> DNA

<213> Streptococcus pneumoniae

<400> 273

| | | | | | | |
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| ggccgcgggt | attcgacgaa | tagctgaaga | ggaaaagcta | ttacatgaag | ttataatccc | 120 |
| aatggaagc | ataaagagat | aaatacaaca | ttcgatttat | atacagttcc | tattgaagtg | 180 |
| atataataag | gttaaagaaa | aatatagaa | ggaaataaac | atgtttgcat | caaaaagcga | 240 |
| aagaaaagta | cattattcaa | ttcgtaaatt | tagtattgga | gtagctagtg | tagctgttgc | 300 |
| cagcttggtc | ttaggaggag | tagtccatgc | agaaggggtt | agaagtggga | ataacctcac | 360 |
| ggttacatct | agtgggcaag | atatatcgaa | gaagtatgct | gatgaagtcg | agtcgcattc | 420 |
| agaaagtata | ttgaaggatg | tcaaaaaaaaa | tttgaaaaaa | gttcaacata | cccaaatgt | 480 |
| cggcttaatt | acaaagttga | gcgaaattaa | aaagaagtat | ttgtatgact | taaaagttaa | 540 |
| tgttttatcg | gaagctgagt | tgacgtcaaa | aacaaaagaa | acaaaagaaa | agttaaccgc | 600 |
| aacttttgag | cagtttataa | aagatacatt | accaacagaa | ccagaaaaaa | aggtagcaga | 660 |
| agctcagaag | aaggttgaag | aagctaagaa | aaaagccgag | gatcaaaaag | aaaaagatcg | 720 |
| ccgtaactac | ccaaccatta | cttacaaaac | gcttgaactt | gaaattgctg | agtcggatgt | 780 |
| ggaagttaaa | aaagcggagc | ttgaactagt | aaaagtgaaa | gctaaggaat | ctcaagacga | 840 |
| ggaaaaaatt | aagcaagcag | aagcgggaagt | tgagagtaaa | caagctgagg | ctacaagggt | 900 |
| aaaaaaaaatc | aagacagatc | gtgaagaagc | taaacgaaaa | gcagatgcta | agttgaagga | 960 |
| agctgttgaa | aagaatgtag | cgacttcaga | gcaagataaa | ccaaagaggc | gggcaaaacg | 1020 |
| aggagtttct | ggagagctag | caacacctga | taaaaaagaa | aatgatgcga | agtccttcaga | 1080 |
| ttctagcgta | ggtgaagaaa | ctcttccaag | cccatccctt | aatatggcaa | atgaaagtca | 1140 |
| gacagaacat | aggaaagatg | tcgatgaata | tataaaaaaa | atgttgagtg | agatccaatt | 1200 |
| agatggaaga | aaacataccc | caaagtgtcaa | cttaaacata | aagttgagcg | caattaaaaac | 1260 |
| gaagtatttg | tatgaattaa | gtgtttttaa | agagaactcg | aaaaaagaag | agttgacgtc | 1320 |
| aaaaaccaa | gcagagttaa | ccgcagcttt | tgagcagttt | aaaaaagata | cattgaaacc | 1380 |
| agaaaaaaa | gtagcagaag | ctgagaagaa | ggttgaagaa | gctaagaaaa | aagccaagga | 1440 |
| tcaaaaagaa | gaagatcgcc | gtaactacce | aaccaatact | tacaaaacgc | ttgaacttga | 1500 |

| | | | | | | |
|------------|------------|------------|------------|------------|------------|------|
| aattgctgag | tccgatgtga | aagttaaaga | agcggagctt | gaactagtaa | aagaggaagc | 1560 |
| taacgaatct | cgaacgagg | aaaaaattaa | gcaagcaaaa | gagaaagttg | agagtaaaaa | 1620 |
| agctgaggct | acaaggttag | aaaaaatcaa | gacagatcgt | aaaaaagcag | aagaagaagc | 1680 |
| taaacgaaaa | gcagaagaat | ctgagaaaaa | agctgctgaa | gccaaacaaa | aagtggatgc | 1740 |
| tgaagaatat | gctcttgaag | ctaaaatcgc | tgagttggaa | tatgaagttc | agagactaga | 1800 |
| aaaagagctc | aaagagattg | atgagtctga | ctcagaagat | tatcttaaag | aaggcctccg | 1860 |
| tgctcctctt | caatctaaat | tggataccaa | aaaagctaaa | ctatcaaaac | ttgaagagtt | 1920 |
| gagtgataag | attgatgagt | tagacgctga | aattgcaaaa | cttgaagttc | aacttaaaga | 1980 |
| tgctgaagga | aacaataatg | tagaagccta | ctttaaagaa | ggtttagaga | aaactactgc | 2040 |
| tgagaaaaaa | gctgaattag | aaaaagctga | agctgacctt | aagaaagcag | ttgatgagcc | 2100 |
| agaaactcca | gctccggctc | ctcaaccagc | tccggctcca | gaaaaaccag | ctgaaaaacc | 2160 |
| agctccagct | ccagctccag | aaaaaccagc | tccagctcca | gaaaaaccag | ctccagctcc | 2220 |
| agaaaaacca | gctccagctc | cagaaaaacc | agctccagct | ccagaaaaac | cagctccagc | 2280 |
| tccagaaaaa | ccagctccag | ctccagaaaa | accagctcca | gctcctaaac | cagaaactcc | 2340 |
| agaaacaggc | tggaaacaag | aaaacggtat | gtggtacttc | tacaatactg | atggttcaat | 2400 |
| ggcaacaggc | tggctccaaa | acaatggctc | atggtactac | ctcaacagca | atggcgttat | 2460 |
| ggcgacagga | tggttcccaa | acaatggctc | | | | 2489 |

<210> 274

<211> 1680

<212> DNA

<213> Streptococcus pneumoniae

<400> 274

| | | | | | | |
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| ggccgcggga | ttcgacgaat | agctgaagag | gaaaagctat | tacatgaagt | tataatccca | 120 |
| aatggaagca | taaagagata | aatacaaaat | tcgatttata | tacagttcat | attgaagtga | 180 |
| tatagtaagg | ttaaagaaaa | aatatagaag | gaaataaaca | tgtttgcatc | aaaaaacgaa | 240 |
| agaaaagtac | attattcaat | tcgtaaattt | agtattggag | tagctagtgt | agctgttgcc | 300 |
| agtcttttta | tgggaagtgt | ggttcatgcg | acagagaagg | aggtaactac | ccaagtagcc | 360 |
| acttctttta | ataaggcaaa | taaaagtcag | acagaacata | tgaaagctgc | taaacaagtc | 420 |
| gatgaatata | taacaaaaaa | gctccaatta | gatagaagaa | aacataccca | aaatgtcggc | 480 |
| ttactcacia | agttgggctg | aattaaaacg | gagtatttgc | atagattaag | tgtttcaaaa | 540 |
| gagaagtcgg | aagctgagtt | gccgtcagaa | ataaaaagcaa | agttagacgc | agcttttgag | 600 |
| cagtttaaaa | aagatacatt | accaacagaa | ccaggaaaaa | aggtagcaga | agctgagaag | 660 |
| aaggttgaag | aagctaagaa | aaaagccgag | gatcaaaaag | aagaagatcg | tcgtaactac | 720 |
| ccaaccatta | cttacaaaac | gcttgaactt | gaaattgctg | agtccgatgt | ggaagttaaa | 780 |
| aaagcggagc | ttgaactagt | aaaagaggaa | gctaagggat | ctcgaaacga | gcaaaaagtt | 840 |
| aaccaagcaa | aagcgaaggt | tgagagtaaa | caagctgagg | ctacaagggt | aaaaaaaaatc | 900 |
| aagacagatc | gtgaacaagc | tgagactaca | aggttagaaa | acatcaagac | agatcgtgaa | 960 |
| aaagcagaag | aagctaaacg | aaaagcagat | gctaaagagc | aagatgaatc | aaagaggcgg | 1020 |
| gtaaaaggag | gagttccggg | agagcaagca | acacttgata | aaaaagaaaa | tgatgcgaag | 1080 |
| tcttcagatt | ctagcgtagg | tgaagaaact | cttccaagcc | catccctgaa | atcaggaaaa | 1140 |
| aaggtagcag | aagctgagaa | gaaggttgca | gaagctgaga | aaaaagccaa | ggatcaaaaa | 1200 |
| gaagaagatc | gccgtaacta | cccaaccaat | acttacaaaa | cgcttgaact | tgaaattgct | 1260 |
| gagtcgcatg | tgaaagttaa | agaagcggag | cttgaactag | taaaagagga | agctaaggaa | 1320 |
| tctcgaaacg | aggaaaaagt | taagcaagca | aaagcgggaag | ttgagagtaa | aaaagctgag | 1380 |
| gctacaaggt | tagaaaaaat | caagacagat | cgtaaaaaag | cagaagaagc | taaacgaaaa | 1440 |

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<210> 275

<211> 1766

<212> DNA

<213> Streptococcus pneumoniae

<400> 275

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 ggaagcataa agagataaat acaaaattcg atttatatac agttcatatt gaagtgatat 180
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 aacaacatta agaacgagta tttgaataaa atagttgaat caacctcaga aagccaacta 600
 cagatactga tgatggagag tcgatcaaaa gtagatgaag ctgtgtctaa gtttgaaaag 660
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 gaacaaccaa aagcagaaaa accagctgat caacaagctg aagaagagta tgctcgtaga 1680
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 caaccatcta ctccaaaac aaanac 1766

<210> 276

<211> 1590

<212> DNA

<213> Streptococcus pneumoniae

<400> 276

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 ataattatgt ttgcatcyaa aagcgaaaga aaagtacatt attcaattcg taaatttagt 180
 attggagtag ctagtgtagc ~~tgttgctagc~~ ttgttcttag gaggagtagt ccatgcagaa 240
 ggggttagaa gtgagaatac ~~ccccaagggt~~ acatctagt gggatgaagt cgatgaatat 300
 ataaaaaaaa ~~tgttgagtga~~ gatccaatta gataaaagaa aacataccca caatttcgcc 360
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 gaagcggagc ttgaactatt ~~gaaagaggaa~~ gctaaaactc gaaacgagga cacaattaac 720
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